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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLXVII. No. 3195.] LONDON, AUGUST 6, 1924. [76TH YEAR. PRICE 1s.

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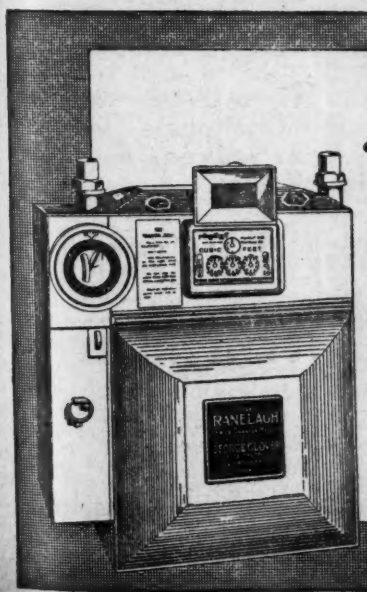

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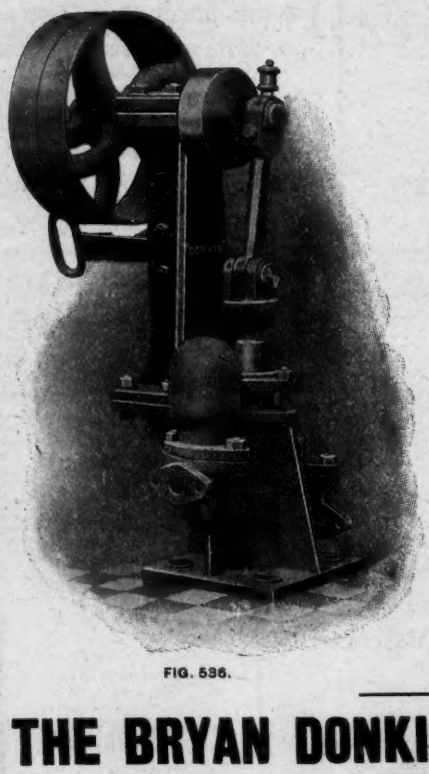

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VOL. CLXVII., No. 3195.] WEDNESDAY, AUGUST 6, 1924. [76TH YEAR.

EDITORIAL NOTES.

Men and Money for Wembley.

A Magnificent Response—But Still More Wanted.

IT is unnecessary at this time of day to say that we of the "JOURNAL" have a high opinion of the British Empire Gas Exhibit at Wembley as a means of arousing public interest in gas, informing the public about gas, creating favourable public opinion towards gas where such did not already exist, and confirming or strengthening favourable opinion where it had already been formed.

We said some time ago that our own observation and the reports that had reached us from independent sources had sufficed to make it certain that, whatever gas experts might feel about the Exhibit—and we now have their highly favourable verdict—it had captured the public fancy, and was fulfilling its primary object of interesting, educating, and pleasing the crowds that throng it daily. We have also expressed, in no uncertain terms, our gratification at the remarkable, unprecedentedly extensive, and extremely encouraging publicity given to the Exhibit in the editorial and news columns of the daily and weekly Press throughout the country; as well as our appreciation of the highly effective direct publicity, national and local, organized by the Executive Committee.

It seemed to us, however—judging from the fact that, although there has been a magnificent response from the industry as a whole, there are still a large number of gas undertakings which either have not subscribed at all to this great national (or rather imperial) enterprise of the industry, or have only subscribed less than the basic rate of 6s. per million c.ft.—that it was desirable to assist the Committee to bring home to the administrators of those undertakings the facts about the present and future value of the Exhibit to every gas undertaking in the Empire; and, incidentally, to make even more clear than it already is to the undertakings that had subscribed at or above the full basic rate, the certainty that they are getting splendid value for their money.

It is not right that the Committee—supported by 80 p.ct. of the industry—should have to make repeated appeals to the 20 p.ct. who have not yet responded. At the same time, it is not right that the publicity schemes of the Committee should be curtailed, and the value of the subscriptions already contributed be diminished, for lack of the funds necessary to complete them—especially as every £1000 spent between now and the close of the Exhibition will be more productive in result than the last; for in advertising it is the final effort that accomplishes the most, if (as in this case most certainly) the early efforts have been rightly conceived and rightly directed.

We have, therefore—in support of our own views, and of the Committee who have laboured so strenuously and faithfully for the benefit of the industry as a whole—sought, and now have pleasure in publishing as a Supplement to the present issue of the "JOURNAL," extracts from the opinions of representative men in the gas industry in all parts of the country, as well as the opinions of their consumers. These opinions are so generally favourable, indeed in almost every case so enthusiastic, that if only every gas director or committee member or councillor who has hitherto hesitated to support "Wembley" could read them all in full, the Committee would not have long to wait for the balance they need. But we think that the extracts for which we have space will suffice to convince everyone that money spent on the British Empire Gas Exhibit is money well invested, and certain to return to the subscriber many times over, in the shape of additional business, in the near future.

There is one thing other than money that the Committee need urgently, and that is more staff for manning the Exhibit. Some gas managers expect that every member of the public visiting the Exhibit should receive the same personal attention as if he were visiting the showroom of the undertaking which supplies him. That is obviously impossible in the conditions necessarily prevailing at a popular exhibition; but more attention is desirable and would be possible if more attendants were forthcoming.

May this be our last—because quickly effective—appeal for the necessary money and men for Wembley. The Dominions Overseas have contributed nearly £1000. Who is prepared to be outdone by them in supporting this historic enterprise?

Compulsory Inspection of Gas Piping, Fittings, and Appliances.

COMPULSORY inspection of gas-fittings on consumers' premises has been brought a stage nearer by the report which Mr. W. J. A. Butterfield, M.A., F.I.C., one of the Gas Referees, has made to the Board of Trade on the subject of carbon monoxide in public gas supplies. The fact has been received with mixed feelings in the gas industry; but, even where there is opposition on the ground of fear of extra responsibility or consequences, there is a philosophical resignation to what has been very generally recognized as the inevitable. Inspection—compulsory or voluntary—was bound to come sooner or later in connection with the bogey of carbon monoxide, or in pursuit of that greater economy and efficiency in the utilization of gas which constitutes the strongest of bulwarks for the interests of the gas industry. It really matters very little which way inspection of gas-fittings as a universal policy comes, as, though it can do little in the reduction of the already low average of fatalities—accidental or intentional—it will serve the industry well through the promotion and maintenance of efficiency in utilization, which is of transcending importance in the present, and will remain so in the future. The report came to hand just before closing for the holidays; and therefore we publish to-day Mr. Butterfield's own summary, his recommendations, and the comments of the National Gas Council upon both the report and the recommendations. From the general report extracts will be given in succeeding issues of the "JOURNAL."

There is every indication in the report that Mr. Butterfield found himself dogged throughout his investigations by incomplete and inconclusive data; and while he desired to deal in a totally impartial, fair, and just manner with what he had before him, and to arrive at a really constructive issue, he made positive deductions from easily challengeable data, which gave the National Gas Council the opportunity for much of their adverse criticism of the work preliminary to the recommendations. The fact does not matter much if a beneficial end is served, save that false impressions may be spread abroad through more attention being paid to the report than to the criticism of it. To the recommendations themselves the Council take no exception; and they are wise in adopting that attitude. It is, in the first place, proposed that the inquiries instituted from January, 1922, by the Board of Trade, in collaboration with the Ministry of Health, into the circumstances of every fatality from poisoning by gas should be continued—the information obtained thereby to be utilized as a guide

in formulating measures for reducing the risks of such occurrences. The Council place themselves unreservedly at the disposal of the authorities for assistance in this work. The next two recommendations are of outstanding importance, as they seek to impose a new obligation upon gas undertakings. They read—

> **That the gas industry be asked to submit to the Board of Trade *at an early date* suggestions for a system of periodical inspection, and of maintenance in safe condition, of gas piping, fittings, and appliances in dwelling-houses.**
>
> **That the suggestions received accordingly, subject to such additions or modifications as the Board of Trade may think necessary, be the basis of a scheme of inspection and maintenance of gas piping, fittings, and appliances *which all gas undertakings specified by the Board of Trade shall be required to adopt and carry into effect without delay*.**

It will be remarked from the words we have italicized that Mr. Butterfield does not think there should be any procrastination in this matter; and in a letter to the Council the Board of Trade mention that they "will be glad to receive *as early as practicable* the suggestions of the Council" with regard to the more general inspection of fittings. A point which is not very clear is as to what Mr. Butterfield means when he refers to "all gas undertakings specified by the Board of Trade" being required to adopt and carry the scheme into effect without delay. It seems that he has in mind discrimination as to application, but it is not stated whether this should be as between statutory and non-statutory undertakings, or between undertakings in the larger urban areas and undertakings serving villages or small towns, which, in the last five or six years, "have been exempt from any increase (or indeed from any serious incidence of risk) of accidental gas poisoning, though in a large proportion of such places a mixture of coal gas and water gas has been supplied." But we are not out of the wood yet. It is easier to propose than to fulfil. The most difficult part of the work will be the devising of a scheme. The Council promise to submit to the Board suggestions for the provision of inspection of piping, fittings, and appliances "as far as practicable, having regard to the inaccessibility of most gas piping, and to the impossibility of discovering in gas fittings and appliances, by inspection, latent defects or defects due to cumulative wear that may subsequently develop." This points to the impossibility of establishing any scheme perfect in character and effect.

The makers of gas appliances it is proposed shall be brought in to collaborate in the elimination of unsound and unsafe appliances, including flueless heaters and geysers without proper and adequate vent to the open air. Whatever proposals are adopted in this particular are recommended for application to all gas undertakings, and makers and vendors of gas appliances. If after a specified period the adopted plans are not successful, then it is proposed that powers shall be conferred upon local authorities to stop the sale and supply in their areas of untrustworthy gas appliances. While the Council will also assist in this direction, they point out that many appliances are at the present time supplied by firms over whom they have no supervision or control.

With these few general references to the recommendations and to their qualified acceptance by the National Gas Council, we must leave the report so far as this issue of the "Journal" is concerned.

No Smoke-Producing Fires in New Houses.

Some important amendments were effected in the Smoke Abatement Bill when in Committee in the House of Lords last Friday. It has always been said that in this matter succeeding Governments have shown a strong reluctance to do anything inimical to the domestic fire grate, chimney, and poker, though well knowing that the domestic grate and chimney are responsible for a very large share in the promotion of atmospheric pollution and all the attendant evils—evils destructive of life, health, and property, besides creating a considerable amount of uneconomy in labour and expenditure. Clause 4 of the Bill empowered the making of by-laws "requiring the provision in new buildings, other than private dwelling-houses, of such arrangements for heating as are calculated to prevent or reduce the emission of smoke." An amendment was moved by Lord Newton to leave out the words "other than private dwelling-houses;" and it was announced that this would be accepted by the Government. This is highly important. It will be noticed that the clause refers only to new premises. Another amendment (at the instance of Lord Newton) inserted the words "and cooking" after "heating." These amendments provide a good road to increased work in the application of non-smoke-producing means of heating and cooking to all houses erected from the time the Bill becomes law. This will supply a great opportunity for the gas industry; and it will be interesting to see how architects and builders will deal with their new responsibility in this regard. It should enable more economical construction by the elimination of chimney breasts, and give greater cubical capacity to rooms. The coal grate and coal cooking range makers will not like the encroachment on their business; and the coal merchants (who have not evinced any particular courtesy towards the gas-fire the last year or two) are not likely to be overjoyed. However, scientific heating must supersede the crude use of coal. Other modifications were made in the Bill, but of less importance so far as the gas industry is concerned. One of them was that the word "black" was deleted from clause 2; it being urged by Lord Newton that it was extremely difficult to prove that smoke was "black;" and, in his view, there should be ability to proceed against people if the smoke were objectionable or dense, and not because it was black. The changes convert a poor Smoke Abatement Bill into something really effective.

"Mains of Insufficient Capacity" Clause.

The long discussions between the railway companies and the National Gas Council over the mains of insufficient capacity clause having shown that there was no possibility, without external aid, of the parties coming to an amicable understanding, only one thing was left to be done, and that was to submit the matter to a tribunal of one of the Houses of Parliament. The opportunity was afforded by the Pinner Gas Order, which it was hoped might be regarded as a "test case." It was before a House of Commons Committee that the question came last week for consideration. Although the Chairman of the Committee (Mr. D. Reid) announced that they could only deal with the matter as affecting the Pinner Order, the parties fully appreciated that anything that is now settled will be regarded as a precedent, and so be made to apply to subsequent legislation, whether by Bill or Order. Notwithstanding the announcement of the Chairman, the Committee also realized this, and their responsibility. In view of the importance of the matter, we have reported the proceedings at some length. But the upshot is briefly that the Committee have indicated their feelings regarding certain points, and have left the parties to try again, during the parliamentary recess, to come to a mutual agreement over the matter; and then the result will be brought before the Committee in the autumn session. The matter has been narrowed down somewhat through the expressions of view of the Committee. It seems clear that they are persuaded that there should be some relief from the obligation to supply in the event of lighting and domestic service being jeopardized through an extraordinary industrial demand being made upon it. But, while admitting that the offer of arbitration is good in the event of a dispute, they are of opinion that there should be discrimination between large and small industrial concerns, that the clause should not apply to the latter, and that they should not be put to the expense of going to arbitration in the event of a refusal to supply under the clause.

Pending the result of the further discussion between the parties, it is preferable there should be no independent expression of opinion as to the form a modified or amplified clause should take; it can be well left to the good sense of both to do their best now to arrive at an agreement. Their failure to do so will simply mean that the Committee will themselves deal with the matter. The railway companies may be satisfied, if we interpret the views of the Committee correctly, and the act of (so to speak) referring back the question to them, that the clause to which they object, with the additions suggested by the industry, will not be entirely abrogated, but will be modified by the Committee to conform with their intentions as to discrimination between large and small industrial consumers. Passing from any further allusion to the question of modification, there are two or three points which may be emphasized. It is rather ridiculous to suggest that because the gas industry wish to possess a clause which will enable them to protect existing

lighting and domestic consumers they are doing anything to choke-off industrial business. Gas undertakings are out for all they can get in that line; but in view of the nature of the industrial business, it is as well that they should be enabled to deal with exceptional circumstances. As a matter of fact, this clause is as important in the interests of the general consumers as the one affecting stand-by supplies.

The point appears to be conveniently or negligently overlooked that the obligation to supply on demand within defined conditions was imposed in the circumstances existing in 1871, when there was no idea that the diversity in volume of demand would ever come about that has been introduced into gas service by the industrial load. Had the Legislature of those days foreseen what was going to happen, we have not the slightest doubt that the obligation to supply would have been accompanied by terms other than those which the railway companies have lately been assiduously seeking to preserve. All that has to be done to show the equity of the gas industry's case in this particular is for Mr. Reid's Committee and the railway companies to try to picture the circumstances in which the obligation to supply was put forward fifty-three years ago, and compare them with those that obtain to-day. There is certainty that then the need for some modification of the stringency of the old enactment would be better appreciated. Moreover, in the industrial region whence comes demand for volumes of gas of a largely varying order, the gas industry is subject to intense competition. This being so, the element of uncertainty in this business is enlarged; and thus the compulsory obligation to supply requires additional conditions in order to protect the public interests (as represented by the general body of consumers) as against the individual consumer whose needs may necessitate a large amount of capital expenditure, which through a subsequent transfer of custom, might be rendered unprofitable to the gas undertaking. It is the bounden duty of Parliament to alter their own old enactments to suit new and changing circumstances. Where mains are of sufficient capacity to afford the demanded industrial supply, no question would ever arise; but it would be a great hardship, where a main is at present adequate to needs, if local enlargement had to be effected for a single establishment without provision being made for a profitable continuity of the demand. In a public utility concern, there should be protection against speculative demand. The Chairman of the Committee put the point that inadequacy of mains for a new supply surely meant that the distribution system required improving. But a main may be locally sufficient one day, and, through a new demand, it may on the morrow be locally insufficient. The Chairman also put the point that if the manufacturing plant were of insufficient capacity to meet the demand, the undertaking would have to extend it; then why not the distribution mains? The simple answer is that the manufacturing plant is applicable to the whole system, while a local main only affects a small part of a district or even a single road. There is no analogy. As a rule, consumers of large volumes of gas for industrial purposes obtain concessions in price, and for this and other reasons—such as the possibility of a change of patronage—there is no justification for allowing their custom to impose any financial burden upon the undertaking or the consumers generally. These are all points which must be considered; the railway companies seek to ignore them, and to judge the position from the standpoint of 1871. It would be an advantage if they would temporarily—if they cannot do so permanently—bring themselves up-to-date in their consideration of matters affecting gas supply.

"White Coal."

At the recent World Power Conference, a great deal was heard as to the inestimable blessings that water power is to many countries through the provision of cheap electricity. Even the slogan "White Coal" was trotted out—a slogan (absurd in its application to water power) which has been adopted generously by those who have an interest in promoting the use of water power, and by certain daily papers which are fond of trying to lead the public to the belief that by one means or another their expenditure for light, heat, and power can be diminished in extraordinary measure. Of course, those countries with large water-power resources are to be congratulated upon their good fortune; but this country is not in possession of similar advantages. Therefore, the tales as to what electricity does in those countries can only interest or excite envy, as it is impossible to reproduce here the results secured from the best of water-power circumstances. The circumstances of water power and electricity demand are not the same in all places; and as the conditions recede from the most favourable for securing high and uniform efficiency, so the results in the matter of cheap supply of electrical energy also fall from the highest standards. From the varying reports heard and read, one can only conclude that it does not always do to give credence to all the wonderful things said to be accomplished where water power rules. There may be something below the surface which is worth knowing, and which discounts what is presented for absorption. For example, the plant required for the generation of electricity by water power strongly leans to heaviness in the matter of capital expenditure and maintenance; and when one hears of these things, there is a disposition to ask whether the low charges for energy are always capable of standing alone, and at the same time show a profit after meeting total costs.

In the "Electricity Supply Memoranda" last week, it was seen that someone in America considers, in relation to electricity supply, that these are days of much loose thinking and slogans. There is a fair measure of truth in this. The much-used phrase "Develop White Coal" is a slogan and an injunction which can be carried too far; but it is one of those things that work into the imagination of some people. The promoters of water-power schemes know this; and they have made the best possible use of the knowledge. Compliance with the slogan can be carried too far. Anything requiring heavy capital expenditure, if built largely in excess of a margin of safety to the maximum demand, must have the charges met for that excess from some quarter—which is not necessarily (in this case) the low rates charged for "white-coal" generated current. The slogan as to developing white coal can be misapplied, and the provision of water-power plant can be much over-done. According to an esteemed correspondent who is much behind the scenes in the near quarters of Northern Europe, excessive provision over requirement has occurred in parts of Norway. He tells us that the main reason why many of the smaller communities and the sparsely populated districts in that country have been experiencing financial difficulties—often to such an extent that the State has had to come to their rescue—is that far too many and too large electric power stations have been built. The slogan as to the development of "white coal" has been pressed into popular notice and acceptance on the ground that it would avoid the importation of "black coal." This has been alluring to the man in the street; but in practice the policy has proved a financial failure. In some communities, our informant states, the total income from the sale of current, despite extravagant use, does not cover the interest and the other capital charges, let alone the money required for salaries, wages, and miscellaneous expenditure. In certain places, the policy has been to sell electrical energy at considerably below cost; the specious reason advanced for this being that this would create more demand, and so reduce expenses. But there is a limit to the productive capacity of plant; and the upshot has been more capital expenditure on the provision of additional plant, and the last financial state has been worse than the first. In short, the system upon which electricity supply in Norway has been developed is declared by our friend to be thoroughly unsound from the financial point of view; and the citizens have had to pay the deficits through higher rates and taxes.

An interesting and highly satisfactory piece of information is that, in spite of such serious competition as electricity below cost price, most of the gas-works in Norway are forging ahead; and for them business results in a profit. In the circumstances, only prudent and efficient management, with reasonable prices, enables this to be done. It is said to be a general experience that people who have adopted electric cooking gradually return to gas, as they find it cheaper than electricity at cost price. The complaints of slow operation and expensive repairs are very general among those who employ electricity for cooking. Summing-up, our correspondent says the position of the gas industry in Norway is bright; but the same cannot be said of the electricity undertakings. The news is instructive in view of the booming of "white coal."

Some official statistics as to the deaths caused by gas and electricity in the whole of Norway, are included with the other information. The deaths appear to be more prolific

in the country districts than in the towns. However, taking both together, in the eight years ending 1919, the number of deaths due to electricity was 55; in the same period only six were due to gas, and two of these could not have been caused by town gas as no gas-supply system exists in the places where the deaths occurred. Be it noted these are "official" statistics. From the official reports of the Bergen Fire Brigade, statistics have been compiled as to fires caused by gas and electricity since 1901 to the end of 1921. The total for gas is 48, and for electricity 89. Of the fires caused by electricity, 37 occurred in 1920, 1921, and 1922—respectively 9, 10, and 18, as compared with 2 in 1919-20, 0 in 1920-21, and 2 in 1921-22 for gas. The insurance experts of Norway have come to the conclusion that no less than 10 p.ct. of the total fires in the country are originated by electricity.

The Government and Unemployment.

WHEN on the platforms at the last General Election, the Labour-Socialist candidates promised that, if returned to power, one of the first problems to which they would effectually attend would be unemployment. They have had their opportunity; and they have not done anything more than other people were trying to do. They find this is a matter which cannot be disposed of by the mere waving of a magician's wand. For unemployment definite causes exist—some of which cannot be dealt with by the Government. Those which can be would take considerable time to become effective, and some of these a Labour-Socialist Government dare not touch, for every trade union in the country would be up in arms against them. The cheerfulness of the election platform is not seen to-day; and the glib tongues and the promises of a speedy reformation in respect of unemployment are not heard. A Labour-Socialist Government have had their chance; they have still got it. But they find the problem is a deeply rooted one, and not something of a superficial nature which could be dealt with by simple means. Responsibility has taught the Government many things—things they refrained from acknowledging prior to ascending to office. It is now admitted that the costs of production are too high. But labour positively declines to do anything to assist in reducing them, and so increasing the scope of employment. They will do nothing concrete to help to make British goods more attractive in the foreign markets. High wages, lessened production per man, easier conditions of employment, must continue inviolate. The engineers must have another £1 per week appended to their wages; the men in the building trade must have the pound of flesh for which they have asked; the electricians must be given another 10s. per week. The handicaps upon our industries must be piled-up, unemployment notwithstanding. The Chancellor of the Exchequer (Mr. Snowden) says there is no inconsistency between high wages and low costs of production. Perhaps not in normal times when the costs of production are low, and we are not industrially in a state of emergency. But costs are not low now. We have not the competitive place in the markets abroad; and there is the unemployment here, because there nobody wants our high-priced goods in sufficient quantity to give 100 p.ct. of employment. Labour-Socialist statesmen can be mightily illogical when they have to play to a trade union gallery. It is necessary that the problem shall be looked at fairly and squarely, and the necessary sacrifices be made by all concerned in the question of unemployment in order to secure such a demand for our goods that unemployment is reduced to the absolute minimum. It is not only that high production costs prevent a bigger demand for British goods in the markets abroad; their high price is an invitation to other countries, with production costs lower than ours, to dump their cheaper goods into this country, and so further assist to keep unemployment at a high level. The present burden of rates and taxes is another effective brake upon industry. The Government recognize that these are things that are obstructing the progress of industry; but they confess that they are too adamant for them. There is only one way of permanently improving matters, and that is to place, as far as possible, our industries in a position to compete with those of other countries.

The Government have nothing new in the way of immediately applicable schemes which will bring relief to the unemployed. They believe that the solution of the problem is to be found in the full development of our national and natural resources, and in the scientific organization of production, to the end that there is elimination of waste in every sphere and every department. That is partially true. But it is not "the" solution; it is only a contributory part to it. Elimination of waste and the attainment of a higher efficiency would help industry; but this is not a matter that can be realized with revolutionary suddenness. Men and industries have been working in that direction for years, without any assistance from the Government; but anything the latter can do to help will be heartily welcomed. But substantial progress cannot be made which will have immediate effect upon the existing mass of unemployment. The Government are proposing to contribute to drainage and arterial road schemes; they are pressing the railway companies to do more in the matter of electrification. Electricity, in fact, bulks largely in their employment-promoting schemes. Everywhere it is in their line of vision, and it forms their horizon. They cannot get outside it. They talk on the one hand of developing our national and natural resources and eliminating waste, and yet seem to think the use of coal, the destruction of its valuable products, and a thermal efficiency never exceeding in the best of circumstances 18 p.ct., is the way of salvation for our industries. To them the one thing needed by industry is power; another thing of equal importance is heat. Power represents a fraction of works costs. It is to these basic and elementary matters that the Government should first direct attention, so as to get a proper perspective of the task before them.

That old monstrosity the Severn barrage scheme is to be revived; and upwards of £90,000 spent upon its further investigation. In other directions electric power is to be developed from coal on "sound" business lines. Electrical experts will be interested in this political intention to educate them in the right methods of carrying on their work. Greater powers of co-ordination are to be given to the Electricity Commissioners, as well as the compulsory powers denied to them in 1919. Electricity is also to be produced throughout the country at a uniform frequency; and, with this end in view, an expert has been authorized to enter into negotiations with municipalities and power companies. The State will undertake this standardization at a cost which may be something like 10 millions sterling. The State may also assist in laying down main transmission lines. It would be interesting to the taxpayers to know the grounds on which the Government think they are proceeding along correct lines; and it would also be instructive to all industries to be informed exactly why the electrical industry is singled out for State aid, while between most industries there is an inter-relationship as important as any that exists between electricity and the other industries. The Government appear to have adopted a line of action in this regard without that fundamental investigation as to the whole requirements of industry which is necessary to give assurance that the right road is being traversed. The present Government are in the matter of unemployment simply pursuing the policy of muddling through, and are grasping at any straw that comes their way.

The M'Kenna Duties.

These came to an end last Friday; and it is expected that the effects will be widespread—not only on the industries immediately concerned, but those from which they draw their supplies. This particularly applies to the motor car industry, which obtains parts largely from various sections of the engineering industry. Up to the present the effects have been a matter of speculation; experience will now begin to accrue, and then we shall know definitely the results.

Educating the M.P.'s.

A greater interest is being taken by Members of Parliament in the work of the Fuel Research Station than has hitherto been the case. This is excellent, as truly we have heard enough from politicians to attest a vast ignorance on their part of the valuable investigations that are being made to improve the results of the use of the chief of our natural resources. Mr. Shinwell, the Parliamentary Secretary to the Department of Mines, is an enthusiast in the work which has fallen to his lot; and, there is no question about it, he is an ardent admirer and supporter of the scientific explorations which are proceeding at the Fuel Research Station. Last Thursday he, with Mr. Charles Edwards, the Secretary of the Miners' Group of Members of Parliament, accompanied about thirty members of the House to the Station, where they spent nearly two hours examining the experimental

plant and appliances, and in hearing from Dr. Lander, the Director, particulars of the great national work upon which he and his staff are engaged.

Foundation Piling.

In another column we publish a brief description of a new system of piling (which has just been completed at the Aberystwyth Gas Company's works) in connection with the foundations of a new gasholder. We are indebted to the Engineer and Manager (Mr. J. Gaunt) for both description and photographs. The latter show the piling machinery and the corrugated wave formation set up by the vibration when extracting the tube—thus consolidating the concrete left in the ground to form the pile Other engineers who are situated as is Mr. Gaunt in regard to waterlogged ground may find these particulars interesting and useful for future foundation work.

Eight-Hour Day Bill.

The text of the eight-hour day Bill has been issued. Its primary object is to confirm the draft convention adopted at the Washington Conference in 1919 of the International Labour Organization of the League of Nations. It provides that (exclusive of recognized intervals for meals or rest) the working hours of persons employed in any industrial undertaking shall not exceed eight in any day or forty-eight in any week. A large number of operations are cited as coming within the ambit of the Act, among them gas, electricity, and water-works. Provision is made for the working of an extra hour per day where, by law, custom, or agreement between employers and employed, or their respective organizations, the hours of employment on one or more days of the week are less than eight. Where persons work in shifts, employment may be for more than eight hours per day; but the working hours must not exceed forty-eight per week. Where operations are carried on by a succession of shifts, the total working week must not exceed an average of fifty-six. In case of accident, urgent work, or exceptional circumstances, the hours imposed by the Act may be exceeded; but all hours beyond those authorized are to be regarded as overtime.

Electricity Wages Dispute.

The members of the various trade unions associated with the electricity supply industry have decided that, unless a satisfactory settlement in respect of the national claim of 10s. per week advance has been arrived at by Aug. 15, the workers will be instructed to cease their duties.

An Alderman and a Municipal Contract.

Mr. Alderman Braithwaite is a member of the Leeds City Council; and he is the Managing-Director and a shareholder of Messrs. Whitaker and Sons, Ltd., who on July 4 last year contracted to supply the Corporation with troughs and covers for troughs. Mr. Braithwaite, in consequence of this, and of his continuing to sit and vote as an alderman, has been brought before the Courts by Mr. J. B. Lapish, an accountant of Leeds, who submitted that by reason of Mr. Braithwaite's connection with Messrs. Whitaker and Sons, he was disqualified from acting as an Alderman, and was subject to penalties under section 12 of the Municipal Corporation Act, 1882. The case was heard in the King's Bench Division by Mr. Justice Bailhache. It is stated that a similar case has never yet been decided. His Lordship, in his judgment, held that defendant was disqualified from acting as an Alderman; and a nominal penalty of £10 was imposed, with costs.

Sugar Beet Industry.

Speaking in the House a week ago on unemployment, the Chancellor of the Exchequer (Mr. Snowden) gave some information as to how the Government propose to assist the sugar-beet industry in this country. Some people think the "assistance" will not, on balance, be of much account. However, since then the information has been published that, in addition to two existing beet-sugar factories at Cantley and Kelham, and a third at Clowick, at least six more factories are to be erected involving the permanent investment of capital of between two and three millions sterling. Four of these factories are to be commenced this autumn. Through the Sugar Beet Society (which is a propagandist body), a scheme is now in course of preparation for the promotion and maintenance of a school for the sugar-beet industry, in which students will be specially trained for technical posts in the new industry. This information holds out the prospect of a further development of the home market for sulphate of ammonia.

Motor Spirit Tax Favoured.

The Automobile Association has issued a booklet dealing with the report of the Departmental Committee (Ministry of Transport) on the Taxation and Regulation of Road Vehicles. Both Mr. Stenson Cooke, the Secretary of the Association, and Mr. Sidney Straker, representing the Society of Motor Manufacturers and Traders, record their reasons for dissenting from the main report, and express themselves in favour of the substitution of motor spirit taxation for the present tax. They say they are convinced that, for the purpose of collecting from motor owners their required contribution for road costs, a motor spirit duty is an equitable and practicable method. That view is opposed to the main report of the Committee.

PERSONAL.

Mr. A. W. OKE, of Hove, who has been Auditor to the Sandown (Isle of Wight) Gas and Coke Company for many years, has been elected to the vacancy on the Directorate caused by the death of the Rev. T. W. H. Jacob.

Last Saturday a beautiful smoker's cabinet, in mahogany, was presented to Mr. A. STANSFIELD (Foreman in the Brass Department), by the employees of Messrs. George Orme & Co., Atlas Meter Works, Oldham, to commemorate fifty years' continuous service with the firm. The presentation was made to Mr. Stansfield by the Senior Representative, Mr. James R. Lee.

OBITUARY.

The death occurred on Friday, at Dronfield, of Mr. HERBERT N. LUCAS, who for thirty years was Clerk to the Dronfield Urban District Council. He passed away at the age of 68 years. Mr. Lucas was a Director of the Dronfield Gas Light and Coke Company, to whom he rendered valuable service.

GAS EXAMINATION PRIZE WINNERS.

Awards by the Society of British Gas Industries.

There has been forwarded to us by the Secretary of the Society of British Gas Industries (Mr. Arthur L. Griffith) the following list of winners of the prizes given by the Society in connection with the City and Guilds of London Institute Final Examinations in Gas Engineering, Gas Supply, and Gasfitting. The PASS LISTS will be found on pp. 461-2 of last week's "JOURNAL."

GAS ENGINEERING.

First Prize, 5 Guineas.

Sidney Herbert Miles, examined at the University College, Reading.

Second Prize, 2 Guineas.

John Wm. Chambers, examined at the Technical College, Derby.

GAS SUPPLY.

First Prize, 5 Guineas.

James Millar Allan Mitchell, examined at Rutherford College, Newcastle-on-Tyne.

Second Prize, 2 Guineas.

Duncan Dewar Melvin, examined at the Royal Technical College, Glasgow.

GASFITTING.

First Prize, 5 Guineas.

Arthur Wm. Skeggs, examined at the Technical Institute, Redhill.

Second Prize, 2 Guineas.

George Ferdinand Wickham, examined at the Municipal Technical School, Birmingham.

Treatment of Effluent Spent Liquors from the Distillation of Ammoniacal Liquor—We are compelled to hold over until next week the concluding portion of the extract on this subject from the last report of the Chief Inspector under the Alkali Works Regulation Act.

A "Wembley" Lamp by Aeroplane.—The makers of the "Wembley" Lamp, Messrs. H. Staniforth & Co., Ltd., a fortnight ago sent by air-mail a 16-light one to Czecho-Slovakia. This is probably the first time that a gas lamp has been sent abroad by aeroplane.

North of England Gas Managers' Association.—We learn from the Hon. Secretary (Mr. Norman S. Cox, of Sunderland) that the autumn general meeting of the Association will be held on Friday, Oct. 10, in the Co-operative Hall, South Bank, under the Presidency of Mr. S. Shadbolt, of South Bank.

DEATH OF SIR GEORGE BEILBY.

It is with deep regret that we have to record the death, on the 1st inst., in his 74th year, at No. 29, Kidderpore Avenue, Hampstead, of Sir George Thomas Beilby, LL.D., F.R.S., whose services to the gas industry, and to the country generally, in connection with researches in fuel economy will always be remembered with gratitude.

Born in 1850, he began his association with the Scottish shale oil industry by joining the Oakbank Oil Company in 1869. The improvements in the process of distilling shale with which he was concerned included a method of treating with steam the spent material from the retorts to recover the residual nitrogen as ammonia. He was a member of the Royal Commission on Coal Supplies in 1903, and of the Royal Commission on Fuel and Engines for the Navy in 1912; and when it was decided by the Department of Scientific and Industrial Research in 1917 to establish the Fuel Research Board, Sir George Beilby was appointed Chairman of the Board and Director of Fuel Research. These positions he held for nearly seven years; his resignation being accepted with much regret in June of last year. He still, however, retained his membership of the Advisory Council of the Department, and acted as Honorary Adviser to the Board—which, it may be recalled, was created to investigate the nature, preparation, and utilization of fuels of all kinds. Under his guidance the now well-known Fuel Research Station at East Greenwich came into being, and work was done of which fitting acknowledgment is made below in an appreciation by Mr. J. Ferguson Bell, of Derby, who, as President of the Institution of Gas Engineers, writes on behalf of the industry for which Sir George did so much good work. In the therm system of charging for gas he has conferred a lasting benefit upon both the makers and the users of gas. Again, Dr. C. H. Lander, who was long his colleague, and who succeeded him as Director of Fuel Research, points out, in another appreciation which readers of the "Journal" will peruse with keen interest, that Sir George, while developing the process of ammonia recovery from shale, already referred to, conducted a number of parallel experiments in steaming bituminous coal in vertical retorts of the type used for shale. As a result of his labour and researches, low-temperature carbonization assumed a new and more important aspect.

In the list of Birthday Honours for 1916, there was included among the new Knights the name of Mr. George Thomas Beilby, F.R.S., "a well-known chemist and inventor, who has specially studied fuel economy, and has rendered service to the Admiralty as a member of the Central Committee of the Board of Inventions and Research, and in other ways." Ten years before this, he had been elected a Fellow of the Royal Society. Honorary degrees were conferred upon him by the Universities of Glasgow, Birmingham, and Durham. He was President of the Society of Chemical Industry in 1899, of the Chemical Section of the British Association at their South African meeting in 1905, of the Institute of Chemistry in 1909-12, and of the Institute of Metals in 1916-18. In 1921 he was appointed (as one of those representing the medical or other sciences) to serve on the Advisory Committee for Coal and the Coal Industry. He was an Honorary Member of the Institution of Gas Engineers, to whom he presented a paper, in 1921, on "Steaming in Vertical Gas Retorts," which included a valuable report on tests at the Fuel Research Station. In the same year he delivered the James Forrest Lecture before the Institution of Civil Engineers—taking for his subject "Fuel Problems of the Future."

The Funeral.

The funeral took place at Golder's Green Crematorium yesterday, and was attended by a number of friends of the late Sir George. Lady Beilby was present with her son, Mr. H. M. Beilby, and Mrs. Beilby.

The service was conducted by the Rev. Canon L. S. Hunter, Canon of Newcastle Cathedral. There were numerous floral tributes, in token of the regard and affection in which the memory of the deceased was held. In addition to that of Lady Beilby and other members of the family, there was one from "The Staff of the Castner-Kellner Alkali Company, Ltd.," and another from "His colleagues of the Cassel Cyanide Company." The Fuel Research Board were represented by the Director, Dr. C. H. Lander, M.I.Mech.E. Mr. J. G. King, F.I.C., A.R.T.C., Chief Chemist at the Fuel Research Station, East Greenwich, was present on behalf of the Chief Engineer, Capt. J. Fraser Shaw, R.N., who is absent on leave. The Institution of Gas Engineers were represented by the Secretary, Mr. Walter Dunn, M.I.Mech.E.

In the beautiful grounds which adjoin the church, the ashes were scattered later in the day, in accordance with the expressed wishes of this simple-hearted man, who by the charm of his disposition and the high integrity of his character, had won for himself an abiding place in the affection of everyone who had the privilege of his friendship. His memory will be cherished by them. All he so unselfishly did during the period of the great war, and since, will ever be held in grateful remembrance by his countrymen, and particularly by those in the gas industry who were associated with him in his invaluable work.

APPRECIATIONS.

By Dr. C. H. Lander, Director of Fuel Research.

The news of the death of Sir George Beilby, which took place on Aug. 1, will be received with great regret by his many friends in the gas industry. Sir George was born in 1850, and was the son of an Edinburgh doctor. After passing through Edinburgh University, he commenced his industrial life in 1869 in the works of the Oakbank Oil Company, where, in conjunction with William Young, he introduced various improvements in shale distillation, notably those connected with recovery of ammonia by treating the material with steam after the oil had been extracted. This work had a considerable effect on the economics of the industry, and it is hardly an exaggeration to say that, without the economies so effected, the Scottish shale industry could hardly have been maintained in the face of the strong competition of imported petroleum. It will be interesting to the gas industry to note that, while developing this process of ammonia recovery from shale, Sir George Beilby conducted a number of parallel experiments in steaming bituminous coal in vertical retorts of the type used for shale. Beilby left the shale industry after some years of useful work, in order to develop inventions for the production of cyanide. The processes which resulted therefrom formed a great advance on the older methods, and resulted in the bulk of the trade in these materials concentrating itself in the companies which Beilby had formed.

His name, however, is best known in the gas industry in connection with the economical use of fuel, a subject which he made peculiarly his own. In 1912-13 he served on the late Lord Fisher's Commission on Fuel and Engines for the Navy, whose findings in certain important directions were almost entirely based on Sir George's experimental work. This Commission exhaustively examined the possibility of obtaining fuel oil from existing home industries, and reported that the only means of rendering the country to some extent self-supporting in the matter of fuel oils lay in the development of a new carbonizing industry founded on the distillation of bituminous coal at a temperature much below that used in gas-retorts or coke ovens. In this way, the subject of low-temperature carbonization, which up to that time had been looked upon merely from the point of view of the production of smokeless fuel, assumed a new and much wider significance.

The connection of Beilby with oil shale distillation, which is essentially a low-temperature process, naturally attracted his attention to low-temperature carbonization; and he was one of the earlier investigators into its possibilities. The result of work carried out under him at the Maryhill Works of the Cassel Cyanide Company was communicated to Section B of the British Association at Birmingham, in 1913. That the process he worked with could be used to treat comparatively non-caking coals only was a disadvantage; and although improvements were effected so that a unit plant was eventually obtained in which a throughput of 15 tons per day was easily maintained, he decided to discontinue the experiments. The experience gained in the work was, however, afterwards used to advantage in the experimental work at H.M. Fuel Research Station. During the war, when the supply of oil for the Navy became a most pressing problem, Beilby again rendered yeoman service to the Government in their inquiries and experiments.

The object lessons which had been afforded by the experience of the war brought the definite recognition by the Government that some measure of State aid should be afforded in the solution of the many problems which presented themselves in connection with the proper utilization of fuel, and led to the appointment in 1917 of the Fuel Research Board with Beilby as first Chairman and Director of Fuel Research. Beilby pointed out to the Cabinet that, although their scheme of investigation could have no possible effect in relieving the situation during the war, "it was of paramount importance that this question of the supply of home-produced fuel oils for the Navy by the carbonization of the coal at present used in the raw state should be independently and exhaustively studied, in order that a definite decision as to the possibility or impossibility of the proposals should once for all be arrived at."

The heavy burden of work that Beilby, like many others, undertook during the war undoubtedly produced results which helped considerably in its successful prosecution, but his self-abnegation did not stop at this. He undertook in the middle of the war, and entirely voluntarily, a piece of work which would have appalled a lesser man, and which he foresaw would involve his full time and attention long after peace had been declared. Indeed, until the middle of 1923, he continued to guide the destinies of the great national institution which he had founded, and it was only when he felt that he had placed it upon a secure basis that he decided to leave its further development and use to others. Any success which may attend the wide schemes of fuel research undertaken by the Government will be entirely due to the care, foresight, and thoroughness with which the foundations of the work were laid by him. After retiring from the Chairmanship of the Fuel Research Board, Beilby continued to act as its Honorary Consultant. His advice was continually sought, and

freely given, up to within a few days of his death. His intellectual powers remained unimpaired to the end, and his last paper, consisting of a masterly exposition on oil production in relation to the needs of the Empire, was presented at the World Power Conference, though his illness prevented him from reading it in person.

In addition to his work on fuel during the war, Beilby was a member of Lord Fisher's Board of Invention and Research, and was also the Chairman of the Trench Warfare Committee. He was a member of Lord Haldane's Coal Conservation Committee, and was one of the original members of the Advisory Council for Scientific and Industrial Research. He was also a member of the Advisory Committee of the Mines Department. These last two he attended most regularly until illness intervened some five months ago.

An important service which Beilby rendered to the community was the institution of the method of charging for town gas by the therm. The far-reaching effect of this method is only just becoming apparent, but there can be no doubt that the economies which can be effected as a result of the freedom given to the gas industry, in choosing those methods of working most suitable to the local conditions, will have an important result in improving the health and well-being of the community.

Beilby was elected a Fellow of the Royal Society in 1906 and received the honour of knighthood in 1916. The Universities of Glasgow, Birmingham, and Durham conferred honorary degrees upon him. He acted as President of the Society of Chemical Industry, the Institute of Chemistry, the Institute of Metals, and the Chemical Section of the British Association.

In research work in pure science Beilby had made peculiarly his own the study of the micro-structure and physical properties of solids in various stages of aggregation. He had adopted this line of research because he could follow it in the odd moments that occurred in the midst of his other great interests. The results of his researches are developed in many published papers, among which may be mentioned "The Hard and Soft States in Metals," "The Polishing of Metals and Other Substances," and "The Disintegration of Metals under Alternating Stresses." His book "The Aggregation and Flow of Solids" presents a most fascinating account of work which commenced in 1900, and which he pursued actively until a year or two before his death. His skill as a microscopist was brought to bear on problems relating to the combustibility of coke. His theories of the formation of cell structure have opened-up lines of inquiry of which the end cannot yet be seen. In all his work Beilby had the somewhat rare faculty of being able to see the wood as a whole, while losing no relevant detail of the individual trees. His papers and reports were prepared with scrupulous care to avoid, where humanly possible, any misunderstanding.

Sir George Beilby was a man of the most lovable disposition. His entire freedom from bias in forming a judgment on the many difficult problems with which he had to deal throughout his life was a noteworthy characteristic. He was very reserved and sensitive, but when the occasion demanded he spoke most forcefully. His complex nature made him impenetrable to the casual acquaintance. He was cautious in placing trust in the newcomer; but his confidence, once it was obtained, knew no bounds, and he trusted implicitly. He won the devoted admiration and affection of all who worked with him; but though always gentle, he had no mercy for the quack or the unscrupulous. Indeed, his character is best summed up in the forceful words which Lord Fisher used in referring to Sir George in his book: "That he was as meek as Moses and as thorough as Cromwell."

For the last ten years of his life he devoted himself entirely to the good of his country. He refused to take any payment for his services, not even a refund of his personal expenses; all patents taken out in connection with his work he made over to the Government; he presented many items of expensive plant to the Fuel Research Station, and helped generously and secretly many who needed encouragement or assistance in a new undertaking. He was both sympathetic and critical; and though he had a great heart, it was not worn on his sleeve.

The Fuel Research Station at East Greenwich remains a monument to Beilby's foresight and imagination. In addition to its conception, he supervised the actual detailed design and construction under conditions of the greatest difficulty. Beilby was not only a fuel technologist and engineer, he was also an industrial chemist of world-wide repute. His creative brain was behind several great industrial enterprises. He was a craftsman of marked ability, and had constructed with his own hands a large organ in his beautiful home in Glasgow. He was a musician and an organist of distinction. His death will leave a gap in many quarters which it will indeed be hard to fill.

By J. FERGUSON BELL, President of the Institution of Gas Engineers.

All interested in scientific and industrial research, more especially those who realize the paramount importance of more attention being given to the conservation of our fuel supplies, much regretted to hear of the death of Sir George Beilby, who, during a long life of 74 years, accomplished by unstinted effort a notable service to the country by his researches in fuel economy. For many years he was a pioneer in the Scottish shale oil industry, bringing into use numerous improvements, which, with the assistance of skilled scientific colleagues, revolutionized the production of shale oil. His experimental investigations in low-temperature carbonization of shale and bituminous coal, with fractional distillation of the liquid products, resulted in carbonization being regarded from a new aspect.

The success attending vertical retorts for distilling shale and the recovery of residual nitrogen as ammonia by admission of steam, is well known; and his noteworthy investigations for the production of fuel oil from home sources to supply the country's need in a time of peril, will cause the name of Beilby to be remembered with affectionate regard. He was Chairman of the Scientific and Industrial Research Advisory Council, which position he retained until last year, remaining Honorary Adviser. It is well known that he was largely responsible for the design, construction, and operation of the well-equipped Fuel Research Station at East Greenwich (which incidentally owes much to the assistance of Dr. Charles Carpenter, C.B.E.) that has already done a great deal to put the technical problems of the use of fuel upon a sound scientific basis, substituting for empirical data exact data by experimental investigations.

The gas industry owes to the late Sir George Beilby a special debt of gratitude for his unselfish voluntary services and far-reaching influence, by which a new system of charging for gas supplied was introduced, whereby consumers are charged for the actual thermal units supplied. The President of the Board of Trade, in 1917, asked the Fuel Research Board to advise as to—

> What is the most suitable composition and quality of gas, and the minimum pressure at which it should be generally supplied, having regard to the desirability of economy in the use of coal, the adequate recovery of bye-products, and the purposes for which gas is now used.

The foresight of Sir George Beilby enabled him to perceive from investigations and inquiries, after careful consideration being given to the interests of consumers and producers, that the most important existing organization for the distribution of potential heat-energy should in future be based on the sale and purchase of heat-energy measured in fixed units which can be scientifically determined by simple means. The result was that Parliament some two years later gave effect to the recommendations of the Fuel Research Board, as approved by the Board of Trade, that the unit to be adopted in charging consumers for gas supplied should be 100,000 British thermal units, which for convenience is called a "therm."

The late Sir George will be long remembered by our industry as a pre-eminent fuel technologist and chemical engineer of outstanding distinction, who won admiration and affection for his single-minded services to advance the future welfare and well-being of the community.

ELECTRICITY SUPPLY MEMORANDA.

"DEFEND our industry from more legislative interference" is the prayer of many electrical men. But our old friend, the "Electrical Review," appears to be rather elated over the political interest that is being taken in the electricity supply industry. It is obvious that the efforts that have so far been made to bring about a greater unification in electricity generation threaten, without further legislation, to become abortive; and we seem to trace a leaning on the part of the "Review" towards the hope that something will happen which will bring this about. Anyway there is no doubt it welcomes any fresh breeze from any quarter that temporarily springs up and indicates that something more will be done towards that end. This end a greater number of electrical engineers fervently trust will never be achieved—in fact, they have greater faith in the industry working out its own salvation in its own way without the intervention of a lot of busybodies who think they know better what is required than the men whose special business is electricity generation, distribution, and supply. The "Review" says that the Liberal (meaning the Lloyd-George) report on "Coal and Power" with which we dealt in the editorial columns a fortnight since, has aroused considerable interest in political circles; our contemporary does not mention that it has aroused considerable amusement in technical circles. It might have said this, without making any departure from the truth. The volume is simply a piece of cheap political propaganda. Then there is the memorandum of the Labour Party which threatens a determined attack upon the London Electricity Supply Bills now before Parliament. Then our contemporary finds that the hands of the Government are being forced by circumstances. A rumour is afloat that the Government have abandoned the idea of nationalizing the supply of electricity as being hopeless of attainment, and that they contemplate endowing the Electricity Commissioners with compulsory powers to enforce the unification of electrical generation and transmission. The Government, through Mr. Snowden, on Tuesday night, made no secret of the fact that they intend in the autumn, or early next year, to introduce a measure conferring on the Commissioners the compulsory powers deleted from the 1919 Bill. The "Review" thought it was almost inevitable some such action would be taken. There is one thing that has been overlooked. It is that something will have to be done to make action compulsory on the part of the Joint Electricity Authorities, or they might not be willing to exercise the compul-

The Political Outlook for Electricity Supply.

sory powers with which probably well-meaning, but highly-mistaken, legislators are proposing to put in their way.

The Labour Party's Memorandum.

This pamphlet is a splendid instance of political intervention in opposition to schemes that have originated from technical sources, and have been endorsed by technical authority. The Labour Party seek to stir up a righteous indignation among the public by entitling their missive "London Threatened by an Electrical Trust." Of course, London is not menaced by any such thing. The title is an example of one of the tricks of the political trade; and it may be more effective than all the matter which follows, which few will read, and fewer will understand. The "Electrical Review," it should in fairness be mentioned, does not support the memorandum; it is very much against it. There are two London Electricity Supply Bills involved; and they have been passed by the House of Lords, and are now before the Commons. Their provisions, as our contemporary points out, are in the main the result of long-protracted negotiations with the London County Council; and the measures have also the approval of the Electricity Commissioners, who decided some of the details on which the promoting Companies and the County Council were unable to agree. In place of purchase in 1931, the scheme in the Bills provides for an extension of the Companies' tenure to 1971. But the terms confer benefits on the consumers; and there is to be a sliding-scale of price and dividend very much on the lines of the basic price and dividend plan of the South Metropolitan Gas Company. The "Review" mentions that the standard dividends upon the ordinary shares will be limited to 10 p.ct. up to 1931, and 7 p.ct. afterwards, unless the aggregate charges to consumers are reduced below the standard prices. If they are lowered, the Companies may distribute, in addition to the standard rate of dividend, one-sixth part of the aggregate reduction. The limitation of dividends up to 1931 may not have much direct effect on prices by itself. The chief immediate impression on prices will be due to the elimination of the need for reserves against the 1931 purchase. The sinking fund will benefit from the longer tenure; the County Council will not have to borrow the many millions which would be required if purchase were to take place in 1931; and the Companies will be able to take better advantage of modern progress in generation. A big station, for instance, is to be erected at Barking, with trunk mains to various areas. The "Review" hopes that the Government will counter any attempt of a few Members of Parliament to obstruct or destroy the "most promising piece of constructive legislation which has been proposed towards the partial solution of the London electricity supply problem."

No Optional Patronage.

There are some municipal authorities with electricity supply stations and housing schemes who, with an eye on the business of the former, think themselves quite justified in declining to allow the tenants of the dwellings to exercise their own will in the matter of a gas or electricity service, or partially one and partially the other. The Liverpool Corporation Housing Committee appear to be of the opinion that they have the right to determine this matter for the tenants of some 1000 houses they are proposing to erect at Walton and Clubmoor, which are to cost £600,000, and 121 flat residences in the same area, which are to cost £100,000. The Chairman of the Committee (Mr. Thomas White) states that they hope to create an electric city. But the scheme of house electrification, it appears, will depend on the policy pursued by the Tramways and Lighting Committee, who are considering a plan for considerably reduced charges to the householders. Mr. White points to the advantages of a cheap supply of electricity in the abolition of smoke pollution, the improved cleanliness of the house, and the greater ease which would result for the average housewife by the installation of electric fires, boilers, washers, ironers, &c. For these purposes what is meant by a "cheap" supply? A supply of anything is not cheap which causes an expenditure in excess of what the same service can be rendered for by other means. Water, he says, can be heated during the night when the electricity plant is not fully employed. By gas, householders can heat water cheaply as and when required, without the hot-water storage and the long-hour heat losses occasioned by electricity. The planning of the electric house would, in his opinion, bring down the cost of construction by eliminating the necessity for chimneys. The same thing can be done equally well by gas; and this would be far cheaper for the householder—in respect of all heating operations. If history repeats itself, there will be objection on the part of the householders in this new residential area at Liverpool to being compelled to patronize an agent which is more costly than another. So far as we have seen, the Council have not yet approved of the scheme.

Dust and Light Depreciation.

There are electrical engineers who pretend that their knowledge justifies them in laughing at the submissions of gas men who have made careful investigation of particular subjects in which they themselves are interested. When gas men talk of the stagnant condition of the atmosphere in rooms that are occupied perhaps by several people and are electrically lighted, the electrical man gives a sort of ironical guffaw. When the gas man talks of the mechanical action of a gas-flame keeping the atmosphere in a state of motion, which can be used by easy means to create, without cost, a simple but effective ventilation system, there are signs of merriment on the part of the electricians. When gas men speak of the beneficial effect that a gas-flame produces upon the dusty atmosphere of a room, electrical men chuckle as though dust is an unknown quantity where electricity is employed. But now we have the results of experiments which show a considerable depreciation of the light-giving value of electric lamps owing to the deposition of dust upon the bulbs or the surrounding glassware. If there is no dust, there ought to be no deposition. The results of the tests have been published by Messrs. E. A. Anderson and J. M. Ketch in America; and they have been referred to in the "Illuminating Engineer." Lamps—electric or other types—should be cleaned frequently. The "Illuminating Engineer" some months ago stated that inattention to lamp cleanliness might cause a loss of even as much as 30 p.ct. of light. We have seen electric lamps that were almost opaque through internal discolouration and an epidermis of dust; and we guarantee that those lamps were emitting much less than 70 p.ct. of their light. In the tests in question, in one area 120 days' exposure to dry fine dust resulted in a loss of light varying from 11 to 27 p.ct. in the case of direct lighting units, and from 10 to 33 p.ct. with indirect units. Different atmospheric conditions have different light-destroying effects. In a district where the dust is oily and sooty, only 49 days sufficed to cause losses varying from 10 to 35 p.ct. with direct units. With semi-indirect units of the open type, losses at least 50 p.ct. greater were recorded. In the case of the simple open bowl, the loss was as great as 50 p.ct. during the 49-day period. We hope we shall hear no more nonsense from electrical men as to there being no atmospheric dust where electric lamps are used, or as to the lamps maintaining their early power of illumination with only negligible depreciation. With most electric lamps, there is the gradual internal discoloration which cannot be washed off; but it is a pity to sacrifice light in order to save a little elbow grease in cleaning the exterior.

Globe Bottom Vents.

Another interesting point emerges from these tests; and attention is directed to it by the "Illuminating Engineer." While indirect and semi-indirect units are more subject to dirt than direct units, much depends on the design. In this connection, attention is drawn to the effect of a bottom vent hole in a globe. This is one of those little things that are not normally much thought about. Tests have shown that, in the case of a globe with a bottom vent, the light depreciation is 50 p.ct. greater than with a sealed globe. The explanation is that the upward current of air through the aperture causes an infiltration of dirt to the interior, and in some cases about half the reduction of lighting duty is due to the integument of dirt on the interior. Confirmation of this is given by experiments on outdoor lighting units. The results show the importance of fairly frequent and thorough cleansing.

Control of Appliance Construction.

We have not come to the point yet at which there can be absolute standardization of gas and electricity consuming appliances. Nothing in the way of stereotyping should be done which will have a detrimental effect upon progress in thermal and working efficiency. In Norway, where electrical current is, owing to the development of water-power generation, sold at low rates—and sometimes not profitable ones—a large amount of attention has been given to the standardization of electricity-using appliances. A paper on the subject was read at the World Power Conference by Mr. H. Grosch. Hitherto there has been individual control by the electricity supply authorities of such matters as design and construction, as well as testing, inspection, and supervision of finished parts. Unless in these matters there was approval, the authority would not allow connection with the mains. It seems to us that this form of control might lead to every undertaking having its special fads and fancies; and, to meet individual tastes, it might lead to more expensive production. This is recognized, and consideration has been given to a proposal to establish a central establishment for testing and control. One suggested line for effecting control is that all material should be submitted to testing; and another, that approved lists of materials and parts should be published for the information of supply authorities, dealers, contractors, and consumers. Then samples of the manufactured articles would be taken at random and tested periodically, and, if not up to standard, would be struck off the list. The matter is likely to be taken a step farther than this. A Bill empowering the Government to exercise control is being promoted. In co-operation with the Government, the insurance companies, and the manufacturers, detailed directions for the construction and testing of the various materials and parts of electricity-consuming appliances have been worked out by the Association of Norwegian Electricity Works. But it was not considered possible to give very detailed instructions in regard to cooking and heating apparatus, inasmuch as design and construction are still very much in a state of flux. The writer of "Cooking and Heating Notes" in "The Electrical Times" considers that the establishment of a central body with power to control the quality of electricity-consuming devices and accessories has much to recommend it; and "ultimately some such development may be anticipated in this country."

The Lamp Dumping Ground.

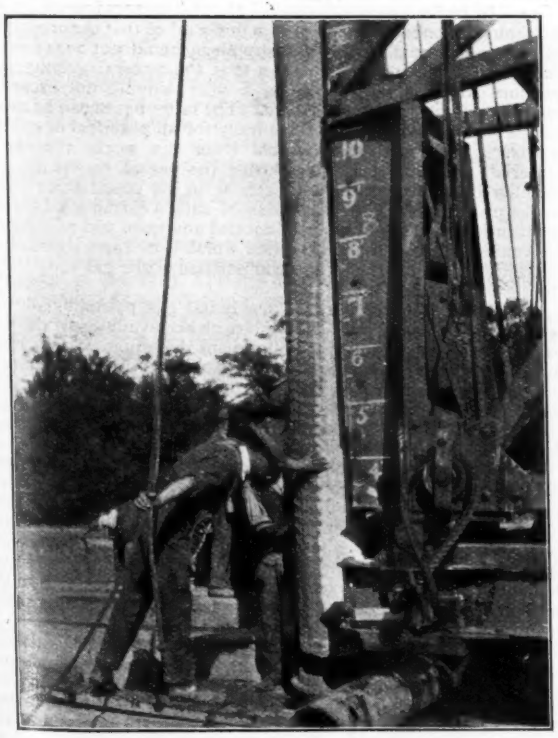
If the British gas-mantle trade has just cause for complaint as to the importation of mantles from Germany and other places abroad, British electric incandescent lamp makers have a substantial reason for being dissatified with the position of things. The flow of such lamps into this country has increased, and is still increasing, largely in volume. The figures are quoted by the "Electrician." Before the war the peak seems to have been reached in 1909, when the number of lamps imported was 8,039,049. From this figure there was a steady decline. For 1911, the imports were 5,260,422; 1912, 4,525,539; and 1913, 3,302 893. Coming to post-war years, in 1920, the imports were 1,202,924 lamps, of which Germany contributed 69,273. In 1921, the total increased to 3,603,723, of which Germany supplied 410,242. In 1922 the total rose to 7,869.566, of which Germany sent 1,967,704; the Netherlands, 2,182,881; France, 1,062,607; and Austria-Hungary, 1,435,491. Last year, there was a further swelling of the volume of this traffic—no less than 11,268,230 lamps being delivered into this country; but the countries of origin are not mentioned. The rate of delivery is being maintained this year, as during the past six months 5,301,292 lamps have entered our ports.

VIBRO CONCRETE PILING AT THE ABERYSTWYTH GAS-WORKS.

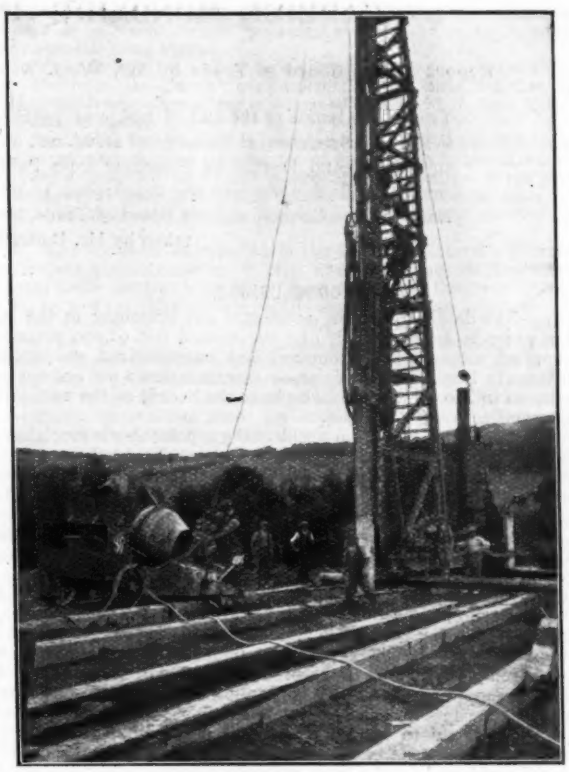
An important engineering development has recently been carried out at the works of the Aberystwyth Gas Company, who have found it necessary to construct a new gasholder with a capacity of 200,000 c.ft. of gas, to meet the growing demands of this popular seaside resort.

The contract for the new two-lift guide-framed gasholder and steel tank has been secured by Messrs. C. & W. Walker, Ltd., of Donnington, Salop. The steel tank is 78 ft. diameter by 25 ft. deep; outer lift 76 ft. diameter by 24 ft. deep; inner lift 74 ft. diameter by 24 ft. deep. The total weight, including water in tank and foundations, will be approximately 4000 tons. This will be carried on a reinforced concrete platform base, which in turn is supported on a well-prepared foundation of 116 concrete piles, 17½ in. diameter, carrying the loads through some 16 ft. of soft clay down to a firm gravel bed.

The piled foundation for this holder forms a noteworthy feature of the work in hand, on account of this being the first gasholder where an entirely new, and exceptionally efficient type of pile (known as the "Vibro" concrete pile) has been adopted. This is a new British invention, and the manufacturers of the well-thought-out apparatus (The British Steel Piling Company, Ltd.) have achieved a pronounced success.



Vibro pile tube being placed in position on the C.I. shoe ready for driving to required resistance and depth in ground. The clay adhering to the side of tube clearly indicates the corrugated wave formation by which the deposited concrete pile is similarly keyed into the ground at each successive vibrating step throughout its length.



Piling in Progress.

The Vibro concrete piles are cast in the ground by the patent process, which consists of ramming the deposited concrete forming the pile column by means of a tube vibrated with the aid of a steam hammer, which the inventor has adapted to serve as an extractor hammer of a more powerful calibre than any hitherto in use. Both the piling frame and apparatus are of a most interesting and novel design. Their employment on the present works marks an historical scientific advance of which more cannot fail to be heard, as it is obvious to anyone witnessing the work that no longer will it be possible for foreign firms to claim the leading place in this field of foundation piling; and the impression is clear that the position will have to be recognized as completely reversed to the advantage of British enterprise.

The carrying-out of the concrete work has been done through the Ferro Concrete Construction Company, of Derby, who entrusted the piling contract to the firm of John Gill, Contractors, 3, Victoria Street, Westminster, licensees of the new Vibro system of piling. This contract has naturally received close attention from the experts of these firms, and the inventor (Mr. A. Hiley, Assoc.M.Inst.C.E.) personally attended to all the initial details in settling these to the satisfaction of Mr. J. Gaunt, the Engineer and Manager of the Aberystwyth Gas Company, under whose care and initiative the present extensions have been proceeded with in such a markedly progressive and successful manner. The accompanying photographs illustrate the new piling plant at work during the operations of constructing the foundations for the gasholder during the month of July, 1924.

North British Association Meeting.—At a recent meeting of the Magistrates' Committee of the Glasgow Corporation, a letter was submitted from Mr. John W. M'Lusky, General Manager of the Gas Department, stating that the autumn meeting of the North British Association of Gas Managers will be held in Glasgow during the first week in September, and requesting that the members attending the meeting, numbering about 300, be accorded a civic reception on the evening of Sept. 4. The Magistrates agreed to recommend that the request be granted, and that it be remitted to a Special Committee to make the necessary arrangements.

Gas Light and Coke Company Co-Partnership Committee.—At the invitation of the Governor and the Court of Directors, the Co-Partnership Committee held a special meeting at the British Empire Exhibition, Wembley, on Tuesday, July 22. The party, which numbered some forty co-partner representatives, met, through the kindness of the London Chamber of Commerce, in their Pavilion, where they were welcomed by the Governor. After lunch they again adjourned to the London Chamber of Commerce Pavilion, where a hearty vote of thanks to the Governor and Court of Directors was passed unanimously. The party then proceeded on a detailed visit to the Gas Exhibit and to the Company's own chemical exhibit, in both of which much interest was shown. After tea, the more serious part of the proceedings ended, and the party dispersed to visit the rest of the Exhibition. Altogether a most enjoyable and instructive day was spent.

CARBON MONOXIDE IN PUBLIC GAS SUPPLIES.

Report to the Board of Trade by Mr. W. J. A. BUTTERFIELD, M.A., F.I.C. (one of the Gas Referees).

THERE was issued at the end of last week by H.M. Stationery Office, Imperial House, Kingsway, London, W.C., and Branches, at the price of 2s. 6d. net, a report by Mr. W. J. A. Butterfield to the Board of Trade on "Accidental Deaths by Poisoning from Public Gas Supplies," together with correspondence arising thereon. To-day we give the conclusions and recommendations, and the correspondence between the National Gas Council and the Board of Trade, leaving over to a subsequent issue an indication of the lines taken by Mr. Butterfield in the body of his report.

CONCLUSIONS.

1.—The death rate from accidental gas poisoning in the last ten years is approximately one per annum per 92,000 premises supplied with gas by authorized and unauthorized gas undertakings in England and Wales, or (say) one death per annum per 350,000 to 400,000 persons who have the benefit of the use of gas in premises supplied with it.

2.—The death rate from accidental gas poisoning is much lower in the smaller towns and villages—viz., about one death per annum per 180,000 premises supplied with gas—than in the large towns, where it averages one death per annum per 73,400 premises supplied. The difference does not appear to be determined by the proportion of carbon monoxide in the gas supplied, but by some differences in the housing conditions, uses to which gas is put, and condition of gas pipes, fittings, and appliances.

3.—There has been an increase in the last five or six years in the proportion of carbon monoxide in the gas supplied by many gas undertakings, both large and small, but no increase in that supplied by others. Taking the gas undertakings as a whole, the increase in seven years in the percentage of carbon monoxide in the gas supplied is about two, and follows an increase of approximately the same order in the immediately preceding seven years.

4.—Relatively to the number of premises supplied with gas, there has been some increase, though not very great, in the number of accidental deaths from gas poisoning in the last five or six years only. Prior to this period, the increase followed *pari passu* the increase in the number of premises supplied with gas.

5.—Prior to the last five or six years, the gradual but steady increase in the proportion of carbon monoxide in the gas supplied had not been attended by any increase in the death rate from accidental gas poisoning.

6.—The increase in the last five or six years in the death rate from accidental gas poisoning coincides with the advent of a period of neglect of internal gas piping, fittings, &c., in the case of supplies through ordinary meters.

7.—The prepayment meter supplies, in connection with which the gas undertakings are usually responsible for the care of gas piping, fittings, &c., show an extremely low death rate from accidental gas poisoning, which rate seems but little affected by the nature of the gas supplied.

8.—The increase in the last five or six years in the death rate from accidental gas poisoning is practically confined to the larger urban areas, and, almost without exception, villages and small towns have, up to the present, been exempt from any increase (or indeed from any serious incidence of risk) of accidental gas poisoning, though in a large proportion of such places a mixture of coal gas and water gas has been supplied.

9.—Certain gas undertakings which show a very low death rate from accidental gas poisoning in comparison with other gas undertakings which supply gas containing substantially the same proportion of carbon monoxide are known to have adopted special measures for the elimination of dangerous fittings, &c., from premises supplied by them.

10.—The mean death rate from accidental gas poisoning in towns at or near the sea-coast is about twice as high as in inland towns of the same size.

11.—The accidental deaths from gas poisoning, with few exceptions, occur in dwelling-houses; between two-thirds and three-fourths of the whole being at night in bedrooms.

12.—Escapes of gas from fractured street mains appear to have been responsible for about four deaths per annum in England and Wales. The average number in the last five years is the same as in the previous five years. Steps are being taken, as the outcome of a conference convened by the Board of Trade in February, 1923, which should result in a substantial reduction even in the small number of fatalities from such escapes of gas.

13.—Of all the accidental deaths attributed to gas poisoning, 15 to 20 p.ct. are in reality due to products of the imperfect combustion of gas, and not to escapes of gas. Such cases are entirely independent of the composition of the gas. Some arise through geysers and heating stoves being fitted, in *very small* rooms, without vents to the open air for the products of combustion; others arise from the attachment to burner brackets of so-called "heaters," which are liable at times, if not always, to cause imperfect combustion of the gas. (See Recommendation IV.)

14.—Pendants, brackets, swan-neck adapters for use with inverted burners, and other fittings, are freely sold to the public (even by some gas undertakings) made of brass tube with seams which are peculiarly liable to split or gape after a few years' use, especially under the corroding influences of the products of combustion of gas-burners immediately underneath, and of the air of seaside places or the dust and air of large towns. Such fittings are potential death-traps, the supply of which is indefensible. (See Recommendation IV.)

15.—About 28 p.ct. of all the deaths from gas poisoning registered as accidental in 1922 were due to escapes from lighting burners—flat flame and incandescent. This 28 p.ct. includes several suspected suicides.

16.—About 72 p.ct. of all the deaths from gas poisoning registered as accidental in 1922 either were due to escapes from gas apparatus, fractures, &c., which would deliver gas into the room of the victim at a rate exceeding—often greatly exceeding—10 c.ft. per hour, or were due to the products of incomplete combustion of gas.

17.—One-third of the escapes responsible for the accidental deaths in 1922 were brought about by the act or default of persons who either were over 70 or under 12 years of age, or were overcome by fainting or other fits, or were inebriated at the time.

18.—Eighteen p.ct. of the victims in 1922 were persons who were, by reason of ill-health or constitutional defects, likely to succumb to a much smaller quantity of carbon monoxide than a person in normal health and condition. Four p.ct. of the victims probably died from other causes; the deaths being, at the most, accelerated by gas poisoning.

19.—If the gas supplied in the 21 months ended Sept. 30, 1923, had *in all cases* been ordinary coal gas, it is highly improbable, from the circumstances, that as many as 20 p.ct. of all the accidental deaths registered in that period as due to gas poisoning would have been avoided.

20.—If gas piping, fittings, and appliances had throughout been of a proper character and maintained in good order, it is probable that at least 50 p.ct.—perhaps 60 p.ct.—of the accidental deaths from gas poisoning in the same period of 21 months would have been avoided.

21.—If the gas supplied in that 21 months had in all cases been subject to a limitation of the carbon monoxide in it to 20 p.ct. (as a maximum proportion at any time), it is highly improbable that as many as 10 p.ct. of all the accidental deaths registered in the period as due to accidental gas poisoning would have been avoided.

22.—In so far as the question of the risk of accidents from gas poisoning is concerned, it is of less importance that the proportion of carbon monoxide in the gas supplied should not occasionally exceed a certain percentage than that the general average proportion over a period—such as a year—should not exceed a correspondingly lower percentage. The latter figure can be ascertained readily, with sufficient accuracy for all practical or control purposes, from certified extracts from the works records of materials used and gas made during the period, by the use of a formula based on established facts as to the possibilities of gas works procedure. The application of such a formula avoids expenditure on a large number of control analyses, and affords in a convenient manner the information which is of most significance in regard to the bearing of the composition of the gas supplied on the risks of gas poisoning.

23.—The full particulars of accidental gas poisoning—in the last 21 months—and such particulars as are available of cases in earlier years, indicate that a limitation of the proportion of carbon monoxide in the gas supplied would cause very little reduction in the number of accidental deaths from gas poisoning unless the limitation were such that practically no gas other than ordinary coal gas would be supplied. Even such a limitation is unlikely *per se* to reduce accidental deaths by as much as 20 p.ct.

24.—A general reversion to the supply of coal gas only, or even any appreciable reduction in the quantity of water gas now introduced into public gas supplies, would be likely to engender a false sense of safety in the minds of the public supplied. It would, moreover, gravely disturb the economic factors which govern the price of gas, and would inevitably result, unless an increase in the demand for gas coke is secured, in an appreciable increase in the price charged for gas by nearly all undertakings, including many of those which now supply coal gas only.

25.—It is clear, from experience gained in connection with prepayment supplies in general, and with ordinary meter supplies in a few areas, that—whether the carbon monoxide content of the gas is low or high—the inspection periodically and maintenance of gas piping, fittings, and appliances by the gas undertaking, reduces enormously the risks of gas poisoning in all premises to which the system is applied. The extension of this procedure presents the best practical means of effecting a substantial reduction in the number of fatalities from accidental gas poisoning. (See Recommendations II. and III.)

The report does not touch upon other aspects of the question of supervision and maintenance of internal piping, fittings, &c., by the gas undertaking. The question has been considered solely from the standpoint of the risks of accidental gas poisoning.

RECOMMENDATIONS.

Certain recommendations seem naturally to follow from the conclusions drawn in the report. They are:

I.—That the inquiries instituted as from January, 1922, by the Board of Trade, in collaboration with the Ministry of Health, into the circumstances of every fatality from poisoning by gas from public supplies, be continued; that the information afforded thereby be incorporated in periodical reports, and be utilized as a guide in formulating measures for reducing the risks of gas poisoning. The reports might suitably cover periods of three or five years.

II.—That the gas industry be asked to submit to the Board of Trade at an early date suggestions for a system of periodical inspection, and of maintenance in safe condition, of gas piping, fittings, and appliances in dwelling houses. (See Conclusions 20 and 25).

III.—That the suggestions received accordingly, subject to such additions or modifications as the Board of Trade may think necessary, be the basis of a scheme of inspection and maintenance of gas piping, fittings, and appliances which all gas undertakings specified by the Board of Trade shall be required to adopt and carry into effect without delay. (See Conclusions 20 and 25).

IV.—That the gas industry be asked, after conferring with the makers of gas fittings and appliances, to submit to the Board of Trade proposals for the elimination from the trade of (1) types and qualities of fittings, &c., which are liable, after a few years' use, to become unsound or otherwise unsafe; and (2) flueless "heaters" or other appliances which are apt to evolve carbon monoxide. Also to submit proposals for preventing geysers, &c., being fitted in very small rooms without adequate and trustworthy vents to the open air for the products of combustion. (See Conclusions 13, 14, and 20).

V.—That these proposals, subject to such addition or modifications as the Board of Trade may think necessary, be recommended for adoption forthwith by all gas undertakings, and by all makers of, dealers in, and vendors of gas fittings and appliances in this country. That if such recommendation fails to prevent, within one year or at most two years, the supply to gas consumers of untrustworthy or unsafe gasfittings and appliances, the Board of Trade shall take steps (in regard to which they may ask, if necessary, the assistance of an Advisory Committee) to secure to local authorities powers to stop the sale and supply in their districts of gas fittings and appliances which do not fulfil such requirements as to trustworthiness and safety as may be laid down from time to time in such manner as they may direct. (See Conclusions 13, 14, and 20.)

Feb. 6, 1924.

CORRESPONDENCE.

LETTER FROM THE NATIONAL GAS COUNCIL TO THE PRESIDENT OF THE BOARD OF TRADE.

The National Gas Council of Great Britain and Ireland,
30, Grosvenor Gardens, London, S.W. 1.
May 20, 1924.

To the Rt. Hon. SIDNEY WEBB, M.P.,
President of the Board of Trade.

SIR,

(1) The Central Executive Board of the National Gas Council desire to submit for your consideration the following observations upon the report of Mr. W. J. A. Butterfield which, through your courtesy, they have had an opportunity of considering.

(2) In doing so they wish to thank you for that courtesy; to acknowledge their sense of Mr. Butterfield's intention to deal with the subject of Accidental Deaths by Gas Poisoning in an entirely impartial, just, and fair manner; to express their satisfaction that he endorses and substantiates the claim of the industry that no grounds for alarm exist in regard to the percentage of carbon monoxide present in the gas supplied in recent years; and to make it clear that their criticisms of his report are directed solely to questions of fact; to some of Mr. Butterfield's assumptions as to what are facts; to his arguments from those assumptions; and to the conclusions he bases upon those assumptions and arguments.

(3) With the recommendations embodied in the Report the Council are in substantial agreement.

With the object sought to be attained by those recommendations—the reduction of gas fatalities, whether accidental or intentional, to the lowest possible figure—the Council are in complete agreement.

As was pointed out by the representatives of the gas industry at the Conference of Feb. 8, 1923, no one is more concerned in any and every effort to eliminate risk from the use of gas than those responsible for the conduct of the industry itself.

(4) It is, however, important to point out at the commencement of any consideration of the subject that, as things are, the accidental fatalities from the use of gas are very few in number, both absolutely and relatively, either (1) to the opportunities for accident that exist in the hourly use of gas in practically every home and place of business in the United Kingdom, or (2) to other causes of fatal accident.

(5) Deaths from gas which are classified as "accidental"—but many of which are the results of deliberate act—only number 3 per million of population per annum, as compared with 63 per million killed in the streets of London.

Five times as many persons die in a year from falling down stairs as are said to be "accidentally" poisoned by gas; and seven times as many through being scalded.

More people have been killed by six days of fog in Manchester than have died from "accidental" gas poisoning in the United Kingdom in a year; while nine days of fog in Glasgow were found to have killed four times as many.

In considering the question of risk of accidents due to gas, it is relevant to point out that the introduction of gas into the homes of working people generally, as a consequence of the invention of the slot meter, brought about a reduction in the number of deaths from oil lamp accidents greater than the total number of fatalities ascribed to gas.

Oil lamp accidents as recorded in the Registrar-General's Returns reached the high figure of 171 in 1895, which was about the time when the slot meter was first installed. In recent years it has been as low as 13, 14, and 15. The average for the ten years ending 1900 was 135, and the average for the ten years ending 1920 was only 24. In other words, there has been a very large reduction in the number of deaths from oil lamp accidents as a consequence of the now general use of gas for lighting in the homes of the working people.

(6) The foregoing facts are mentioned simply to put into their true perspective the realities about gas accidents, and to emphasize *the relative safety* attending the universal use of gas—not for the purpose of raising any objection to any practicable proposal for diminishing further, and if possible eliminating, an already very small risk; for, to the gas industry, one death caused by gas is one too many.

So far, indeed, from regarding with any degree of complacency a death rate as low even as 0·003 per 1000 per annum, the gas industry desire earnestly to see it reduced to *nil*; but they do also desire that the facts as they exist should be considered in comparison with those relating to other risks attendant upon the conditions of modern life in our towns and cities—risks mainly caused by the carelessness inherent in human nature.

(7) Having made clear, it is hoped, their complete agreement with the object in view by Mr. Butterfield, the Council feel bound to take issue with him upon the very important preliminary question of whether the risk of accidental death from gas poisoning has in fact increased in recent years, as has been suggested—that is to say, whether the purely accidental deaths from gas have increased more than in proportion to the increase in the opportunities for accident.

The Council challenge the assumption that any such relative increase has taken place. They believe that, if the facts could be ascertained fully and analyzed accurately, it would be found that the risk of accidental death from gas has not increased, but has actually decreased in recent years.

(8) They believe that such decrease in risk is due to the larger amount of supervision exercised by gas undertakings generally over the selection, installation, and upkeep of gas piping, fittings and appliances in consumers' premises in later years than formerly; and because of the constantly increasing education by the industry of consumers and their children in the proper use of gas during the past ten years or more.

(9) Unfortunately, for more than one reason, it is now impossible to ascertain and analyze accurately all the facts relating to gas fatalities during the past ten years.

No absolutely accurate division of deaths from gas poisoning into "accidental" and "intentional" can ever be possible, because in not a few cases the coroner or jury is unable to determine from the evidence given whether death has been due to accident, to suicide, or to murder. In all such cases of doubtful or insufficient evidence, the coroner or jury is certain, is indeed bound, to give the benefit of the doubt to the deceased, and bring in a verdict of "accidental death."

The more the use of gas as a means of homicide or suicide grows, through publicity given to the subject, the greater will be the number of such doubtful cases included in the category of "accidents."

(10) An approximately (and then only an approximately) reliable analysis could be obtained by an impartial and skilled judge of evidence attending every inquest and reporting confidentially to the Board; and only in such a way. Analyses based upon more or less full newspaper reports are necessarily liable to a considerable degree of error. No such approximately reliable analysis is, however, obtainable in respect even of the fatalities reported since steps have been taken by the Board of Trade to secure fuller particulars relating to gas accidents—much less of those of earlier date. It is therefore obvious that, from the evidence that *is* available, conclusions can be drawn only with the greatest care, and subject to much reservation.

(11) The Council are of opinion, based upon a consideration (*a*) of the increased tendency to suicide and murder arising out of post-war conditions and the depression due to prolonged unemployment; and (*b*) of the increased difficulty of obtaining poisons since the passing of the Dangerous Drugs Act, 1920; that the probabilities are that the numerical increase in gas fatalities registered as "accidental" has been mainly, if not wholly, due, not to accidents, but to deliberate acts. This opinion is strengthened by (1) such examination as is now possible of the statistics for the past ten years*—as to which, as Mr. Butterfield points out, information (and that not more than "fairly full") is available in less than one case out of every two—and by (2) a careful investigation by the Institution of Gas Engineers of the more full but still incomplete information obtained during the past twenty-one months.*

(12) Further the Council are of opinion that, relative to the increased opportunities for accident, there has been a decrease and not an increase in purely *accidental* fatalities from gas.

They submit that in computing for his table the "Expectation of Deaths" year by year, Mr. Butterfield has taken the wrong basis—namely, "the number of premises supplied with gas;" a basis which ignores the "great increase in the use of gas for heating purposes—gas fires, gas ovens, boiling burners, geysers, and other water-heaters"—to which Mr. Butterfield himself refers.

* It is not proposed to burden this memorandum with details of such examination of the statistics and information embodied in the report; but the Council are prepared to submit and discuss such details if desired.

The following figures which relate to the district of one undertaking but are typical of the industry generally, make obvious the very material difference between risks calculated in relation to premises and those calculated in relation to appliances installed in the premises. The latter is clearly the proper basis for any such calculations:

Number of Premises Supplied.

—	(1) By Ordinary Meters.	(2) By Automatic Meters.
1923	375,500	540,600
1913	297,600	480,300
Increase	77,900 (25 p.ct.)	60,300 (12½ p.ct.)

Number of Appliances Installed.

—	In Premises (1).	In Premises (2).
1923	757,800	492,000
1913	428,400	379,000
Increase	329,400 (75 p.ct.)	113,000 (30 p.ct.)

(13) Mr. Butterfield rightly says that "unless allowance is made for the influence of" the great increase in the use of gas for all kinds of heating purposes, "totally erroneous conclusions can be drawn from" the data he gives; but he then, unfortunately, makes no such allowance and consequently comes to what, in the Council's opinion, is the wholly unwarranted conclusion that there has been an increase in the death rate from gas in relation to a reasonable calculation of the "expectation of death" from that cause.

(14) He then proceeds to seek for an explanation of an increase, which, the Council submit, he has not shown to exist, and which, in their opinion, does not in fact exist.

Having satisfied himself, by perfectly sound reasoning from definite facts, that the increase which he thinks exists and calls for explanation cannot properly be attributed to an increase in the proportion of carbon monoxide in the gas supplied, inasmuch as "the death rate varies enormously in different districts notwithstanding a uniformly low percentage of carbon monoxide in the gas supplied by them," Mr. Butterfield puts forward as the explanation for which he has been seeking an alleged difference in policy and practice between some gas undertakings and others in regard to the selection, installation, inspection and maintenance of gas piping, fittings, and appliances.

Of the two undertakings specially selected by Mr. Butterfield as having adopted methods, different from the industry as a whole, which have led, in his opinion, to a lower rate of accidental death from gas poisoning in their districts than elsewhere, one categorically denies having adopted any special policy to that end different from that pursued by the majority of other considerable gas undertakings, and points out that in some respects its policy materially differs from that of the other undertaking singled out for special approval.

(15) What Mr. Butterfield appears to have overlooked entirely in this connection is that the same reasoning that satisfied him that differences in carbon-monoxide percentages were not the explanation of differences in death rates proves that such differences in death rates are not to be explained by differences in practice as to the installation and upkeep of appliances and fittings.

(16) If it be the special policy alleged to have been adopted by only a few undertakings out of 1500 that mainly prevents the death rate in their districts from being higher, and good fortune and circumstances altogether unconnected with the condition of the gas installations play no part in their cases, it is not easy to understand why the death rate has been *nil* in the case of so many other districts in which that special policy has not been adopted.

In every year 95 p.ct. of the gas undertakings of the United Kingdom have no cases of accidental death from gas poisoning to record, yet only a few undertakings out of 1500 are alleged to have taken the precautionary measures supposed to be essential to immunity from accident.

The fact is that an explanation of the alleged increase in risk of accident, or of differences between the death rates in different districts, is no more to be found in differences between the policies of undertakings as to the installation and upkeep of appliances and fittings than in differences between the percentages of carbon monoxide in their supplies of gas.

(17) Mr. Butterfield adduces no evidence, he gives no information as to how or from whom he obtained any evidence in support of his sweeping generalizations to the effect (1) that the death rate from accidental gas poisoning varies relatively to the precautions taken by the different undertakings in regard to the condition of their consumers' pipes and fittings; (2) that "the general adoption of precautionary measures such as those practised by the two undertakings mentioned would greatly advance the security of consumers;" and (3) that "the inspection periodically and maintenance of gas piping, fittings, and appliances by the gas undertaking reduces enormously the risks of gas poisoning," and if it had been generally adopted would have prevented "at least 50 p.ct.—perhaps 62 p.ct.—of the accidental deaths from gas poisoning" in recent times.

The Council differ absolutely from Mr. Butterfield in regard to those wide assumptions and sweeping assertions, for which they submit he has not given any substantial justification, and for which they believe, from an examination of such data as are available, no justification exists.

(18) They agree that it is desirable that only gas piping, fittings, and appliances of a proper character should be installed by or for consumers in their premises, and desire to point out that a great many gas undertakings already do all in their power to ensure that this is done; they agree that water-slide chandeliers and unventilated geysers should be eliminated, and desire to point out that for a long time they have been generally condemned by the industry; they agree that inspection, as already practised by many gas undertakings, is desirable as a matter of good service to the consumer; but they are of opinion that such inspection could do very little to diminish the present low rate of purely accidental death from gas poisoning, and that high expectations of beneficent results to be secured by that means are unfortunately destined to fail of fulfilment.

(19) To summarize their observations:

The Council welcome the reassuring statements as to the absence of relation between accidental deaths from gas poisoning and the percentages of carbon monoxide present in the gas.

The Council are of opinion that, having regard to the widespread increase in the use of gas, the risk of purely accidental death from gas poisoning in relation to opportunities for accident—always extremely small, both actually and relatively—has decreased rather than increased in recent years.

The Council submit that there are good grounds for believing that the numerical increase in gas fatalities registered as "accidental" has been mainly, if not wholly, due to deliberate acts and not to accidents in the true sense of the word; and that the publicity given to the subject has been a contributory cause.

The Council submit that there are no grounds for the suggestion that a material reduction in accidents would have been effected in the past and could be effected in the future by any system of selection, inspection, and maintenance of the pipes, fittings, and appliances installed or to be installed in consumers' premises.

(20) The Council desire to give once more, what they have previously given to the Board of Trade and the Ministry of Health, their fullest assurance of readiness to co-operate at any time in any practicable way in the endeavour to reduce to the utmost possible extent a danger to the public that, while already exceedingly small and not relatively growing, ought if possible to be diminished to the utmost, if it be not possible for it to be eliminated altogether; and in earnest of that assurance give the following undertakings in respect of the recommendations appended to Mr. Butterfield's report:

As to Recommendation I.—To do all in their power to afford complete and reliable information respecting every fatality from gas poisoning from public supplies in the United Kingdom, and to place themselves at the disposal of the authorities for periodical conference upon the ascertained facts with a view to formulating any further measures found necessary and possible for reducing the risks of gas poisoning.

As to Recommendations II. and III.—To submit to the Board of Trade suggestions for the provision of inspection, where not already made by gas undertakings, of the gas piping, fittings, and appliances in dwelling houses so far as practicable, having regard to the inaccessibility of most gas piping, and to the impossibility of discovering in gas fittings and appliances by inspection latent defects or defects due to cumulative wear, that may subsequently develop.

As to Recommendations IV. and V.—To invite the makers of gas fittings and appliances in this country to confer with the Council with a view to submitting to the Board of Trade effective proposals, if such can be devised, for discouraging (and, if possible, preventing) the sale of undesirable types and qualities of fittings and appliances and the fixing of geysers and similar appliances without adequate and trustworthy means of ventilation, it being borne in mind that a great many gas fittings and appliances are not supplied by gas undertakings, but by firms over whom they have no supervision or control.

Yours faithfully,
D. Milne Watson,
President.

Letter from Mr. Butterfield to the Board of Trade.

The Gas Referees,
66, Victoria Street,
London, S.W. 1.
June 16, 1924.

Dear Sir,

I thank you for letting me see a copy of the observations of the National Gas Council on my Report on Carbon Monoxide in Public Gas Supplies.

I am pleased to note that the Council are in substantial agreement with my recommendations, and will assist in giving effect to them. I note also that the Council are in complete agreement with the object sought to be obtained by those recommendations—viz., the reduction of gas fatalities to the lowest possible figure—and as the Council do not recommend any additional or alternative steps for attaining this object, I think it would serve no useful purpose to deal in detail with their criticisms of some of the inferences and arguments in my Report. I would merely say that I have given most careful consideration to the whole of the criticisms and observations of the Council, but nevertheless do not feel satisfied that any part of my report stands in need of revision.

Yours faithfully,
W. J. A. Butterfield.

The Director of Gas Administration,
Board of Trade,
Great George Street, S.W.1.

Letter from the Board of Trade to the National Gas Council.

Industries and Manufactures Department,
Board of Trade,
Great George Street,
London, S.W. 1.
June 24, 1924.

Sir,

I am directed by the Board of Trade to advert to your letter of May 20 last forwarding the observations of the Central Executive Board of the National Gas Council upon the Report made to this Department by Mr. W. J. A. Butterfield on Carbon Monoxide in Pub-

lic Gas Supplies, and I am to express their appreciation of the willingness of the National Gas Council to co-operate with the Board of Trade in taking such steps as may be practicable to reduce to the utmost possible extent any danger to the public which may arise from the use of gas.

The Board of Trade propose to continue to collect information with regard to all cases reported to them of fatalities attributed to gas poisoning, and they are glad to accept the offer of the National Gas Council to do all in their power to afford complete and reliable information with respect to such fatalities.

The Board note also that the Council undertake to formulate suggestions for the provision of inspection, where not already made by gas undertakings, of the gas piping, fittings, and appliances in dwelling houses, and to invite the makers of gas fittings and appliances in this country to confer with the Council with a view to submitting to the Board of Trade effective proposals for discouraging and, if possible, preventing the sale of undesirable types and qualities of fittings and appliances and the fixing of geysers and other appliances without adequate and trustworthy means of ventilation.

The Board of Trade will be glad to receive as early as practicable the suggestions of the Council with regard to the more general inspection of fittings, and to learn the result of the contemplated conference with the makers of gas fittings and appliances with a view to eliminating undesirable types.

I am to add that the Board of Trade think that the suggestion made by the National Gas Council as to periodical conferences upon the information available with regard to fatalities from gas poisoning is one which might usefully be adopted, and that they will not fail to bear it in mind.

I am, Sir,
Your obedient Servant,
A. W. FLUX.

The President of the National Gas Council,
30, Grosvenor Gardens, S.W. 1.

THE REACTIVITY OF COKE.

Causes of Variations in Combustibility.

In "Das Gas- und Wasserfach" for May 3, Dr. K. Bunte, of Karlsruhe, published the results of some recent investigations, undertaken in collaboration with W. Fitz, on the properties of coke, with reference to its varying reactivity or combustibility.

It seems possible, he states in his introduction, that several of the characteristics to which has been attributed the varying reactivity of coke may be operative at one and the same time. He considers that, after evolving a practical method of measuring the reactivity, the important point is to make it clear which of the particular properties of the coke is the decisive factor as regards its behaviour in this important respect. On this must depend the evolution of means for influencing the coke in any required direction during manufacture. The chief factors which have hitherto been assumed to play a part are the volatile contents of the coke, the fineness of particles in the coke structure, and the influence of inorganic constituents. The investigations described by Dr. Bunte concern themselves with the first two of these possibilities.

EFFECT OF THE DEGREE OF GASIFICATION.

In their experiments, the authors confirmed the observations of others that a semi-coke, heated to higher temperatures, assumes a higher ignition point. A semi-coke made from gas coal at between 550° and 650° C. was taken, and its ignition temperature determined. It was subsequently heated for 60 minutes in a stream of nitrogen, and the ignition temperature again determined, with these results:

Size of coke	0·5 to 1 mm.	1 to 3 mm.	3 to 5 mm.
Ignition temp. (° C.)	328°	350°	397°
Do. after heating	483°	502°	532°

These results show clearly that the subsequent heating of the semi-coke diminishes its reactivity, but not by any means to such an extent as to bring its ignition temperature into line with that of bye-product coke, which is generally about 600° C.

It was next sought to determine whether volatile constituents are a determining factor. It can, of course, only be a question of that portion which is volatile up to the ignition temperature. The semi-coke, both before and after subsequent heating as above, was heated in an electric oven up to 450° C.—a temperature above the ignition point (328° C.) of the plain semi-coke, but below that of the semi-coke heated in the nitrogen stream (483° C). The volatile constituents were driven off by a stream of nitrogen which had been purified with the greatest care, and were measured. The reckoning was, however, made only on the basis of the carbon driven off, since it is known that at this temperature free hydrogen does not yet enter into the question, and since small quantities of water cling tenaciously to the coke by adsorption, and can only be removed at higher temperatures which might in other ways influence the experiment. Combustion over copper oxide gave:

Carbon.	Semi-Coke. (a)	Semi-Coke. (b)	Semi-Coke After Further Heating.
Reckoned as hydrocarbons of the methane series (C_nH_{2n})	0·41	0·49	0·03
Reckoned as phenols ($C_6H_4CH_3OH$)	0·42	0·51	0·03

As was to be expected, therefore, there was a loss in the volatile constituents. But the quantity removed was very small, even with the semi-coke strongly heated at a temperature above its ignition point, so that it seems hardly likely that the low ignition temperature (328° C.), and still more the high reactivity which remains, should be attributable to them. By way of confirming this, the semi-coke was heated in a boiling sulphur bath (444·5° C.) under a vacuum pump for a sufficient period for the flask, when disconnected from the pump, to maintain the vacuum for over 30 minutes—*i.e.*, until there was no further gas tension. The ignition temperatures, before and after, were 397° C. and 402° C. respectively—*i.e.*, unchanged within the limits of permissible experimental error.

CHANGE IN SPECIFIC GRAVITY AND HARDNESS.

Some observations on the after-heating of the coke in a nitrogen stream may, however, be made, which tend to show clearly that there is some change in the coke structure. The specific gravity showed a not insignificant rise from 1·493 to 1·787. And the hardness, reckoned on the Moss scale, increased from barely 3 to over 4, which indicated that there had been a thickening of the coke substance.

ADSORBENT CAPACITY AS A MEANS OF MEASURING FINENESS OF PARTICLE.

Most recent investigators seem agreed that the fineness of particles of the coke structure influences the reactivity; but conclusive proof, state the authors, is still lacking. This characteristic, however, is not exactly represented by "porosity," which term, in the ordinary accepted sense, denotes the relative pore-volume—*i.e.*, the proportion of pore-space to total volume. Equal pore-volume, or porosity, can occur with a large number of small thin-walled cells, or with fewer and larger cells having thicker walls. But it is upon the fineness of particle—*i.e.*, the proportion of surface to mass—that depends what might be termed the relative pore surface. As a means of measuring this, it was decided that the adsorbent capacity towards gases was sufficiently reliable. This, even if not entirely independent of material characteristics, can be taken as a measure of the total particle surface of basically similar substances such as the cokes under investigation.

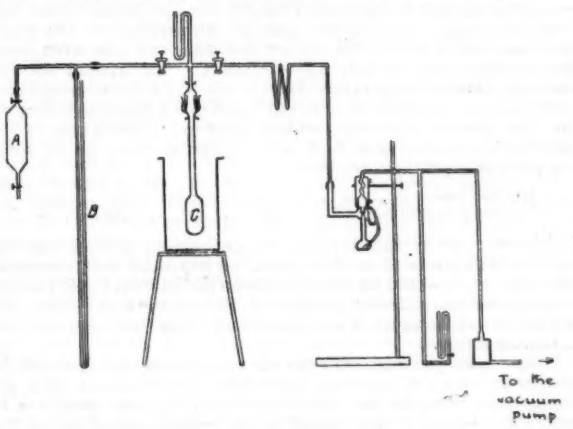


Diagram 1.

The apparatus used is shown in diagram 1. The material to be tested, of known weight, is first rendered quite free of gas in the flask C. To drive off entirely the adsorbed gases, it was found necessary to pump for several hours in an absolute vacuum (Volmer pump) at the same time heating to (say) the temperature of boiling sulphur (444·5° C.). The evacuated flask, of known capacity, is then cooled to 0° C., and connected with a recipient A, also of known capacity, which is filled with the adsorption gas at known temperature and pressure. A barometer B gives the final pressure for the whole system when equilibrium is attained. This consists in the pressure, which can be determined and estimated from the expansion with correction for the temperatures, less the reduction in gas volume due to adsorption. From this is estimated the gas volume adsorbed at the final pressure.

As the measured gas volume is allowed to flow to the adsorption flask several times, curves can be obtained for adsorption at various final pressures. From these curves, the adsorption figure for a fixed equal pressure (*e.g.* 500 mm. mercury) can be read off, or adsorption constants can be determined, with the help of which the adsorption at comparable final pressures can be estimated according to the equation $x = a.p^b$, in which a and b are constants. The curves for the gas volumes adsorbed at various final pressures are plotted in diagram 2 for semi-coke, reheated semi-coke, and bye-product coke, using in each case 20 grammes in 3 to 5 mm. pieces. The considerable variation is clearly shown.

In order to test the relationship between adsorbent capacity and reactivity, the adsorption at equal final pressures of 500 mm. was read from the curves, and also estimated from the curve constants. The constants worked out to—

	A.	B.
Semi-coke	46·7	0·35
Reheated semi-coke	13·7	0·36
Bye-product coke	(0·25)	(0·35)

If the quantity of gas adsorbed at a constant final pressure of 500 mm. and the ignition temperatures are plotted graphically,

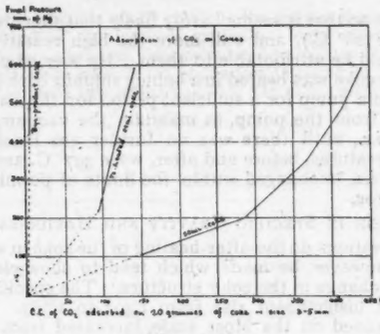


Diagram 2.

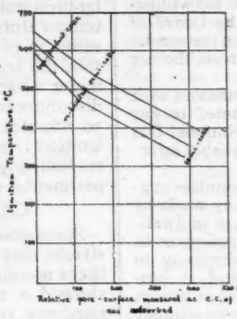


Diagram 3.

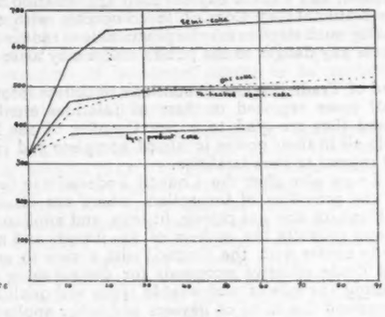


Diagram 4.

there is clearly shown the relationship between them, or, in other words, between the fineness of particle of the coke substance and reactivity. In diagram 3 is shown the connection between the ignition temperature and the relative pore-surface, as found by adsorption of CO_2, for three sizes each of original semi-coke, reheated semi-coke, and bye-product coke. It must be clearly emphasized that adsorption is only introduced as a method of measuring and comparison, and must, of course, on no account be regarded as having any influential connection with the reactivity.

This influence on reactivity of the fineness of particle in the coke is further illustrated in the text by a graph embodying several kinds of German-produced coke, which tends to confirm the authors' contentions.

For the practical application of the principle enunciated, they consider it important first of all to discover the reason for the varying relative pore-surface. With this object, the semi-coke was subjected for one hour to a reheating process up to 1100° C. —*i.e.*, the highest temperature to which the bye-product coke had been subjected. But still the ignition temperature of the semi-coke was below that of the other; this being the case even after longer subjection to heat up to 1100° C. Experiment showed that the ignition temperature rises (or reactivity diminishes) under such treatment rapidly at first, but much more slowly as time goes on. Samples of semi-coke, broken small to 0·1 to 1·0 mm., to ensure rapid percolation of heat, were heated at 1100° C. for varying periods, with these results:

Minutes heated	0	5	60	90
Ignition temperature, ° C.	328	447	483	530

If it was only by the duration of the heating process that the combustibility was affected, it might be expected that considerable variations would be found between the ignition temperatures of samples from different positions in the same mass of coke. No definite proof, however, was forthcoming from tests carried out in this direction.

Taken in conjunction with the changes previously observed in specific gravity and hardness, the authors consider that their investigations point to the conclusion that the coke structure is substantially already determined at the temperature at which the semi-coke is formed, and that the effect of subsequent heat is to cause solidification by shrinkage of the coke, which is generally confirmed by observation during discharging operations.

Time Occupied by Adsorption.

The adsorption of gases on coke must consist in an adsorption on the surfaces of the coke particles, including the open cells, and a diffusion into the coke mass. M'Bain and others have drawn a distinction between this so-called "sorption" and "solution." As a matter of fact, observation of the periodic course of the adsorption until equilibrium is reached has revealed considerable differences in the properties of cokes. This is illustrated in diagram 4. Unfortunately, pressure readings were first noted after ten minutes, as they were originally merely intended to indicate the attainment of equilibrium. The possibility of drawing conclusions from them only suggested itself later. But it was clearly brought to light in the plotting of the curves that with bye-product coke, which is of close texture, the "sorption" plays the chief part, so that equilibrium is reached quickly, while with the reheated semi-coke and gas coke, and still more with untreated semi-coke, the slower process of diffusion or "solution" predominates.

Adsorption of Hydrogen.

Carbon dioxide was used at first, owing to its greater capacity for being adsorbed as compared with hydrogen, which, however, is more readily diffusible. By using hydrogen, the following relationship was able to be established between the gas adsorbed by 20 grammes (size 3 to 5 mm.) of coke and the ignition temperatures:

—	H_2 Adsorbed. C.C.	Ignition Temp. ° C.	Estimated.
Semi-coke	9·5	397	(393·5)
Reheated semi-coke	5·0	532	(531·5)
Bye-product coke	1·5	640	(639·0)

Plotting these values graphically, an absolutely straight line is obtained, so that, for the three sorts tested, the ignition temperatures would seem to be derivable from the hydrogen adsorbed a (in c.c. per 20 gr.) according to the equation $z = 686 - 30{\cdot}7a$. Values thus estimated are shown in brackets.

In the light which it throws upon coke structures, the fact is of great interest that, for different gases, the Bärwald law of adsorption is not applicable, according to which the various cokes tested should each adsorb carbon dioxide and hydrogen in the same proportions. So far from this being the case, it was found that with the cokes which adsorbed carbon dioxide most strongly, the adsorption of hydrogen was considerably less marked.

—	C.C. Adsorbed. CO_2.	C.C. Adsorbed. H_2.	$\frac{CO_2}{H_2}$
Semi-coke	416·5	9·5	43·8
Reheated semi-coke	132	5	26·4
Gas coke	92	3	30·7
Bye-product coke	2	1·5	1·3

This leads to the conclusion that the more readily diffusing gas (H_2) is able to penetrate almost as easily into a dense coke mass as into one less dense. In other words, in the case of bye-product coke, "sorption" predominates for the very heavy carbon dioxide, and "diffusion" for the readily diffusing hydrogen. This perhaps accounts for the fact that the curve for hydrogen adsorption and ignition temperature is a straight line, because the coke structure in this case is really involved, while in the case of the CO_2, "sorption" plays the chief part—*i.e.*, the concentration of the gas on the outer surfaces and in the open cells.

Unfortunately, no success attended attempts to use still smaller and smaller broken coke until a point was reached at which the ratio of the adsorption of carbon dioxide and hydrogen remained constant. Such a point would be reached when the breaking of the coke was carried so far that all pores were open, and only surface adsorption was operative. In this way, the authors had hoped to obtain information as to pore dimensions. Unfortunately, as the reduction of the semi-coke proceeded, other phenomena made their appearance, for which, up to the present, no explanation has been found.

Liquid Fuel from Water Gas.

In a paper on "The Conversion of Coal into Oils," which he submitted to the First World Power Conference, Dr. Franz Fischer stated that one way for the conversion of coal into oils is provided by synthesis from gases. As opposed to destructive distillation and hydrogenation, the larger molecules are synthetized by smaller ones. By gasifying coal or coke into water gas, one can transform the water gas into synthetic oils by means of a high-pressure catalytic process. Dr. Fischer's process for the production in this manner of a motor fuel called "Synthol" is referred to by Messrs. R. T. Haslam and E. W. Thiele, of the Massachusetts Institute of Technology, in an article appearing in "Industrial and Engineering Chemistry." According to them, quite a stir has been made on the Continent by this process, in which water gas compressed to 150 atmospheres is passed at 400° to 450° C. over iron filings coated with an alkali such as potassium carbonate. Part of the water gas condenses to a liquid of two layers, which contains water, fatty acids up to isobutyric, the alcohols to propyl, acetone, methylethyl ketone, many aldehydes and esters, and a trace of hydrocarbons. After removing the acids and water, this mixture makes a satisfactory motor fuel. They add that the process is not yet commercialized, but it is rumoured that the Badische Company are backing it.

Modern Methods of Pipe Manufacture.—The Stanton Ironworks Company, Ltd., near Nottingham, have published a reprint of a paper read at the Shipping Engineering and Machinery Exhibition, held last September, by Mr. E. J. Fox (Managing Director of the Company) and Mr. H. P. Wilson (Foundry General Manager) on "Modern Methods of Pipe Manufacture by the Centrifugal Process." The paper in question was abstracted in the "Journal" for Nov. 21, 1923, p. 511, and is of great interest.

CARBONIZATION.

A Résumé and Criticism of "A Study of the Destructive Distillation of Coal"—Three Cantor Lectures by E. V. Evans.

By Dr. W. B. DAVIDSON.

(*Continued from p.* 448)

THERMS AND CALORIFIC VALUE MULTIPLE.

At this juncture one feels called upon to make a few remarks on net and gross calorific values as affecting the figures for thermal yield. One would have expected that after four years' use the term "therm" would be thoroughly understood by all technical men connected with the gas industry. Prior to 1920, results were stated in terms of B.Th.U. (gross value). Fortunately, the relation between the net and gross calorific value of coal gas is wonderfully consistent, being invariably 100 : 111. Therm values are therefore obtained very simply by adding 11 p.ct. to the old calorific multiples, and lopping-off the necessary figures. An amazing instance of ignorance of the above relation occurred in a criticism of the writer's book on "Gas Manufacture," which appeared in a contemporary journal not very long ago. The critic in question knew no better than to quote certain net results, describing them as ridiculously low and antiquated. For example, he expressed the net calorific value multiple of 6980 as 69·8 therms, instead of 77·5 (11 p.ct. more). If ignorance of this kind were prevalent, a false impression of the relation of past to present carbonization would be general. When pre-1920 carbonizing results of good installations of horizontal retorts are converted into therms, they will be found to fall very little short of those of the present day.

THE THERMAL MODEL.

The ingenious thermal model introduced by Mr. Evans to show in solid form the progress and final results of destructive distillation is undoubtedly a most useful device for lecture purposes, and one admires this painstaking effort to make the subject clear to an audience. One is not particularly enamoured of it when the picture is transferred to paper, and one much prefers the ordinary diagram constructed with ordinates and abscissæ in one plane. This belief is not due to ignorance of drawing, as the view is shared by others who certainly have no such shortcoming. The models showed at a glance a picture representing quantitatively the results of carbonization under the various experimental conditions chosen for investigation, duration being represented by the length, gas volume by the height, and calorific value by the breadth of the model. The result for any given period was therefore clearly represented by the corresponding cross-section. Particularly interesting, if rather perplexing, were the analysis models.

The following may be taken as a summary of the results obtained with the experimental retort plant under different conditions:

Condition of Retort.	H.M. Seal.	Exhauster Pull in H.M.	C.Ft. per Ton.	C.V.	Therms.
	In.	In.			
1. Normal, tight . .	1·0	1·3	13,000	566	73·5
2. ½ in. hole in centre of crown to admit waste gas . . .	1·0	1·3	Increased	Reduced.	75
3. ½ in. hole in centre of crown arranged to admit air . .	1·0	1·3	17,300	419	70
4. Air introduced at ascension pipe .	1·0	1·3	15,550	450	70
5. Vacuum varied. (Level gauge when charging.) . . .	1·0	1·3	18,700	400	74·6

In (2) the increase in therms was produced from the waste gas by the producer-gas reaction at the expense of the coke. Some coal gas was lost, but the loss was more than made good by producer gas. The conclusion is drawn that it would be preferable when it is desired to admix water gas or producer gas to do so under perfect control by means of a regulating valve. Case (3) is only of academic interest. Hydrogen and hydrocarbons are reduced in quantity, while the nitrogen content is high. It is estimated that 5 therms of gas have been destroyed in the retort and 2 therms added. Case (4) is of greater interest as indicating the pernicious effects of leaky retort lids. The therm yield is reduced owing mainly to the combustion of hydrogen in the ascension pipe. This, again, raises the temperature of the offtake pipes, and causes pitch troubles and stopped pipes. To leaky lids, the lecturer attributed the chief cause of stopped pipes. The quality of the tar is adversely affected. The importance of a well-equipped and well-designed retort-house is emphasized. Without this it is possible to work only by rule of thumb, and the expert carbonizer cannot produce the desired results. The only criticism of the foregoing is that a hydraulic main without seal is more conducive to exact control than one with a 1-in. seal, the latter being subject to oscillations which have a detrimental effect. One would like to see the results under similar conditions with a dry main. The greatest economy, it will generally be agreed, is to be attained by carbonizing in a tight retort, though most people would regard three-tenths as a very high working vacuum.

In his second lecture, Mr. Evans gives the following remarkable analysis of gas obtained in very tight retorts with a vacuum of three-tenths and combustion-chamber temperature of 1300° C.: CO_2 0·65, C_nH_m 3·23, O_2 0·2, CO 7·30, H_2 54·6, CH_4 31·1, N_2 2·95, inerts 3·8, sp. gr. 0·376, C.V. 585.

One can only marvel at the low percentage of inerts obtained with three-tenths vacuum. This resembles a long-forgotten far-off gas of the days when the candle-power standard stood supreme, made with pressure in the retort rather than vacuum, with a yield of less than 10,000 c.ft. per ton of coal. It affords a striking commentary on the quality and tightness of the best modern retorts. (And yet the nitrogen evolved from the coal accounts for only about 100 c.ft., or 0·8 out of the 2·95 units p.ct.) One would be surprised, however, to learn that there are many works where a difficulty is experienced in including inert gases during the process of carbonizing.

A very pure gaseous mixture of this kind with high hydrogen content is stated to be too light for the inverted burner, and the lecturer described a method of adding, first, waste gas, and then air, for purification purposes, both under perfect control—a method that calls forth one's admiration for the supreme effort made to secure a remarkably constant gas as calculated at a barometric pressure of 30 in. mercury and a temperature of 60° Fahr. (moist gas). The writer may be pardoned for repeating what he has already urged on the attention of gas engineers—that the 1920 Act stipulates that gas is to be paid for by the therm; that the therm is 100,000 B.Th.U.; and that the gas *as metered*, and not under arbitrary or academic conditions of pressure and temperature, carries the therms. It would be much more profitable for gas undertakings if they claimed the right—surely the indisputable right—of determining the calorific value from day to day under conditions comparable with those of the average consumer's gas supply.

There is no doubt, in any case, that skill in carbonizing and all that it entails—the selection of coals, the choice of carbonizing temperature, weight and duration of charge, vacuum, design of retort setting, fittings, and accessories, and the quality of refractories—is the biggest asset of the present-day gas engineer.

The lecturer rightly deprecated the fact that in the past many investigations of men in the gas industry were merely expressed in terms of cubic feet of gas in a certain (very uncertain, one was inclined to say) illuminating power per ton of coal, and took no account of calorific value, or of the yield and calorific value of tar, coke, &c. The calorific value of the tar, as the author remarked, was not a serious omission, as an average figure can be taken for this so long as one knows the number of gallons. To say, however, that "the results of sound investigations in the gas industry to-day are expressed upon the basis of the thermal yield of each of the products, gas, tar, and coke," is going perhaps too far, seeing that tar is not sold on a basis of calorific value, and is not likely to be, nor is coke sold on a similar basis. It is desirable that a thermal balance should be struck wherever possible, necessitating determination of calorific value of coal, coke, and tar by bomb calorimeter; but very useful large-scale researches, especially those of a comparative nature, can be, and have been, carried out without going to this extreme.

The thermal yield of gas alone is not sufficient. For this reason, one does not regard with great trust small-scale gas-making tests of coal on quantities of 2·24 lbs. or under. These as a general rule omit the collection and measurement of the tar, and one therefore does not know whether the carbonization has proceeded in a normal way. It is easy in the laboratory to obtain a high gas yield by taking care to crack the tar, and it is difficult to choose conditions which truly represent those of the standard horizontal retort. For this reason the small-scale tests performed with 100 grammes of coal per test, described by the lecturer, are not to be taken as truly representing what takes place on a commercial scale. The discrepancy between large and small scale carbonizing, especially at low temperatures, is sometimes very surprising. Even two different designs of small-scale horizontal tubular retorts may give totally different results in yield of tar. For example, in the Interim Report on "Methods of Analysis of Coal," issued last year by the Fuel Research Board, a method of laboratory low-temperature (about 600° C.) assay of coal is described in detail, and typical results are given. In this one finds the following remarkable statement:

"*Tar.*—The large-scale yield is approximately 60 p.ct. of the assay yield." Of the six examples cited in this report the tar yields in the laboratory assay vary from 21·5 to 30·4 gallons per ton of dry coal, while the comparative horizontal retort yields vary from 12·9 to 17·0. With Mr. Evans' laboratory apparatus, on the other hand, the yield with an excellent coal at 525° C. is no more than about 18 gallons; whereas under true low-temperature conditions, say, with a small vertical retort immersed in a bath of lead at 525° or 550° C., the yield would be at least 50 p.ct. more. A full-sized horizontal retort heated externally is, of course, absurdly unsuitable for the production of a proper yield of true primary tar. Enough has been said to indicate that low-temperature carbonization results must be carefully scrutinized, whether on the large or the small scale; much depends on the method of heating, which, strictly speaking, should be such as to avoid entirely all secondary reactions in the tar.

Nevertheless, the results and conclusions of the laborious experiments carried out by the Cantor lecturer with the small retort on the effect of the speed of heat transmission are of great interest, and may with advantage be re-stated as follows:

EFFECT OF SLOWING-DOWN RATE OF HEATING.

1. Weight and thermal content of coke improved.
2. Tar increases up to an optimum point, and then falls off.
3. The gaseous therm yield falls rapidly up to a limit.
4. Carbon and pitch content varies indefinitely.
5. Total volatile therms (gas and tar) decrease.

Experiments made in two-stage carbonization of the coal (first to 525° then to 1000° C.) at different rates confirmed the conclusions:

Rapid heating results in high yield of gas therms.
Fairly slow heating results in high yield of tar.
Very slow heating results in high yield of coke.

(To be continued.)

PROSPECTS OF COMPLETE GASIFICATION OF COAL ON THE SMALL SCALE.

By NORTON H. HUMPHRYS.

An important number of gas undertakings throughout the country do not turn out more than 20 to 30 million c.ft. of gas per annum; and engineers responsible for the design or working of plant suitable to such a small scale of operations will sit down with much interest to study the paper on (almost) complete gasification of coal, which took the place of the customary presidential address at a recent meeting of the Waverley Association of Gas Managers (see "JOURNAL" for June 18, p. 845), and was followed by discussion which was to some extent an appendix to the paper. The bracketed addition is obviously necessary, because coal cannot disappear *in toto*, leaving not a wrack behind. The term is generally understood to mean gasification of the fixed carbon, leaving liquid residuals apart from combustible matter retained by the ash or clinker.

Surprise and disappointment will be the predominant feelings occasioned by perusal. Surprise at the suggestion that one gas is as good as another, that the consumer is not particular to a matter of 150 B.Th.U. or so, and that anything exceeding 350 may practically be regarded as a useless encumbrance. As much is implied if a 350 to 375 B.Th.U. gas can be substituted for a 525 straight coal gas, and accepted without alteration to the distributing plant or burners, increase of supply pressure, or reduction of price. If this can be substantiated, what becomes of the need for calorimeters, uniform quality, pressure gauges and regulations, Gas Referees or Examiners? Disappointment that the selling prices at Prestonpans and Burntisland do not support the brilliant prospects claimed for cupola gas as a means of reducing the selling price of gas to a figure that would compete with solid fuels, assist the Smoke Abatement Committee by the extensive adoption of town gas as a domestic and industrial fuel, and help the conservation of coal by making one ton do the work of three; and that the advantage of closing down for 12 hours out of the 24 is discounted by a loss of nearly half the make of gas.

If a fairly good quality gas coal, such as the Somerset chiefly used in this part of the country, can be put into store at a cost of 25s. to 28s. per ton, local conditions as to sales of residuals and distribution details must indeed be unfortunate, if straight coal gas from horizontal retorts is not compatible with full dividends and a retail price of 12d. to 14d. per therm. The concluding paragraph of the paper does not convey a hopeful prospect, except to the few who find that "coke is a burden at the gas-works."

At present, attention will be limited to considerations of a practical character, though the proceedings included theoretical and scientific conclusions that may be noticed on a future occasion. Also it is necessary to mention that in this part of the country geographical and other reasons prevent more acquaintance with the trend of gas politics in Scotland than can be gathered from the valuable contributions to the Technical Press that come from the other side of the Tweed; not less useful if they happen, like the present paper, and also a recent communication to the Institution of Gas Engineers, to partake of a "no road here" character. The slight extent to which the Gas Regulation Act, 1920, has been accepted in Scotland indicates that important differences to English practice exist, and may partly account for a paper on carbonization in 1924, in which calorimeters or therms are not mentioned, and considerations of obligations introduced by the Act, or the trend of recent Committee inquiries, are conspicuously absent. More than half of the Statutory undertakings in England and Wales, including many small concerns, have accepted that enactment; but out of 240 or so in Scotland, barely 20 are at present legally entitled to sell by therm. The following remarks are presented from an English point of view, and as such are an outside rather than a direct criticism of the statistics and experiences set forth in the paper, or in course of the ensuing discussion.

The indifference to the therm is extended to carbon monoxide. Mr. M'Donald passes 33 p.ct. of this compound in the gas as not calling for special notice. Small gas undertakings cannot give to the consumer's gas fittings the extent of systematic attention that is possible where the services of a fully equipped maintenance department are available; but notwithstanding this drawback, there are no records of special fatalities among gas consumers at Prestonpans or Burntisland. Certainly a feature of the 1920 Act is entire freedom as to composition of gas, because any restrictions in the percentage of carbon monoxide, inerts, methane, or other constituents, must necessarily tend towards limitations of choice both of materials and processes, a fact that is to some extent responsible for persistent endeavours in this direction. But many gas engineers, when considering the respective claims of carbonizing systems available for use, would not fail to consider the probable attitude of the Board of Trade towards 30 to 35 p.ct. of carbon monoxide in town gas.

Following the passing of the 1920 Act, gas engineers were admonished that in future they must think in therms rather than in c.ft.; in other words, they must consider quality in preference to quantity. That the leading spirits in the profession have accepted that guidance is evidenced by the tone of current reports, papers, or communications to the Technical Press. Mr. M'Donald and his friends retain a preference for the c.ft., and therefore the therm equivalents must be added to their figures, to bring them in line with English experiences and working.

"A few examples selected at random" are about as reliable as the results of a spin on a roulette table. If we repeat the selection of prices and qualities (say) a dozen times the chances are that no two will agree. In this case, however, the random shot seems to have gone home on the lower of the only two English declared values below 400 B.Th.U. The selection quoted does not appear fortunate, whether regarded as a fair average representation, or as illustrating the advantages in favour of 350 B.Th.U. gas. The average of the "English" examples is 19·6d. per therm, obviously an excessive figure.

The following are the figures quoted in the paper, with addition of the therm equivalent:

—	Declared Value B.Th U.	Price per 1000 C.Ft.	Therm Equivalent in Pence.
		s. d.	
Scotland	375	5 10	18·7
,,	550	8 4	18·2
England	320	6 9	25·5
,,	618	7 1	13·7
Ireland	400	4 6	13·5
,,	550	10 0	21·8
Australia	430	6 9	18·8
,,	660	12 0	21·8
Minimum average	381	5 10½	19·1
Maximum ,,	594	9 4½	18·9

The advantage in favour of the lower quality, shown on the c.ft. basis, is entirely wiped out by the therm, and the close agreement between the average thermal equivalents is a strong point in its favour. Here it may be observed that out of 57 revisions under the Act, published up to Dec. 31, 1923, only five favoured a reduction.

Three sets of figures are given as indicating the cost of coal and retort-house wages per 1000 c.ft. of gas produced, in pence per 1000 c.ft.

—	Coal.	Wages.
Present working	8·0	5·0
Average for April, 1924	9·0	3·1
,, ,, year, 1923	11·6	3·6

The year's working includes boiler fuel; and a reference to alterations and relining suggests that the latest figures are the maximum results when all is new.

The average cost of straight coal gas in 1918 (make about 13 million c.ft.) is compared with a make of some 23 millions over 1923. The receipts for residuals in 1918 represent only 25 p.ct. on cost of coal; and the increased production in 1923 would mean a substantial reduction in wages, apart from other consideration.

—	1918.		1923.
	Pence.		Pence.
Cost at 27s. per ton	28·3	at 25s. 6d.	11·6
Less residuals	7·1		·5
Net cost of coal	21·2		11·1
Retort-house wages	5·4		3·6
Total	26·6		14·7

Again, the advantage in favour of the new process disappears under the searchlight of the therm. A moderate estimate of the yield of gas per ton of coal carbonized, straight coal gas from hand-worked horizontal retorts, is 60 therms; the make per ton of coal indicated by the above figures is 11,440 c.ft. The quality of the gas in 1918 may therefore be taken as 525 B.Th.U., which agrees with English practice. The respective costs per therm are

Straight coal gas in 1918 . . . . . 5·1d.
Cupola gas in 1923 . . . . . 4·2d.

and the saving 0·9d. per therm, which is not more than might be expected when the output of gas is nearly doubled. But the make of gas in 1923 was only about 30,000 c.ft. per ton, which shows

badly against 58,100 c.ft. on a short period test at Burntisland. The therms per ton are only 105 as compared with 191, and therefore the Prestonpans working must not be confused with results obtained when the scale of operations is sufficient to admit of continuous working.

The water boiling test shows 52·8 p.ct. efficiency, which may be regarded as a small contribution in favour of the superiority claimed for 350 B.Th.U. gas; but the lighting tests are not complete, as the candle duty per hour is not stated. Suggestions to the effect that the lower quality is practically as valuable to the consumer as the higher, are unfortunate as challenging the integrity of the therm and creating a fictitious price valuation in favour of the former that can scarcely be accepted as having been proved by experience. The man in the street, reading them in a non-technical sense, may reasonably infer that one "therm is not as good as another, and that quantity, not quality, is the chief consideration. They constitute an excuse for reduction of quality without a *pro rata* reduction in price as provided by the 1920 Act, to the discredit of the profession. This may explain the disrepute that is sometimes attached to the therm by newspaper writers and platform orators.

The essence of the 1920 Act is the assumption that the therm represents a comparative cash value to the consumer, and that the interests of all parties concerned are best served by unearthing the cheapest therm rather than the lowest quality gas. The consumer gets the best value for his money, and the undertaking enjoys the advantages attendant upon low selling prices. It also assumes that the results indicated by a Boy's calorimeter at the official testing station are a faithful record of the value received by the consumers. These assumptions are not mere personal opinion, but are supported by careful investigation and inquiry. Questions of "efficiency" are chiefly under the control of the consumer, and the gas undertaking cannot be reasonably expected to accept full responsibility in the absence of entire control as to the selection and fixing of appliances. All this does not agree with the suggestion that no matter what quality is reported by the official examiner, the consumer does not get the benefit of anything above 350 B.Th.U. or so, as the excess practically goes to waste, which means that at a constant rate of consumption the results are the same and independent of quality.

The selection from consumers' accounts prove too much, as they show reductions ranging from less than 10 p.ct. to more than 50 p.ct., which does not speak highly in favour of the popularity of 350 B.Th.U. gas. A total increase in annual output may conceal a serious loss on one department. It may consist of a large gain on the slots, and an important loss on the ordinary meters. A knowledge of the losses and their causes is more important than that of the gains, and some of the enterprise applied to securing new business might with as much advantage be devoted to retaining existing consumption, seeing that sources of loss, for the most part, tend to grow and increase. One would like to know the respective sales per consumer in 1918 and 1923, because it is more important to increase the average than to get new consumers, especially so since the cost of services, meters, fittings, &c., has increased. Expressed in therms, the sales are near to 74,000 in each year; yet references were made to the growing character of the district and the laying on of new consumers.

The general experience in this part of the country is that a reduction of 50 B.Th.U. results in complaints. A friend working under a declared value of 450 B.Th.U. informs me that if he goes below 480 there is trouble, because the maximum capacity of some of the mains has been reached. If such experiences are exceptional, why the need for burner adjustments and pressure regulations? Apparently Prestonpans is a young undertaking, and therefore not likely to possess an important flat-flame department, or a number of customers who insist on that class of burner, and, if it does not satisfy them, will turn to competing agents who are making desperate effort to capture cooking and heating business. It is not likely to be encumbered with legacies 60 or 70 years old, in the form of mains, services, meters, and fittings originally laid down to suit flat-flame burners and pressures, and that for one reason and another are not adequately altered or adapted to modern conditions. The same applies to the manufacturing, purifying, and storage plant, which, as experience accumulates, is laid down on a more liberal scale and with better facility for extension.

The economical limit cannot be a descending line terminating in a vanishing point. A story is told of an Irishman who saw an improved make of stove, claimed to save 50 p.ct. of coal, and promptly decided to buy two and save the whole. But as much cannot be realized in practice. If 350 B.Th.U. is as good as 525, why should not 300, 250 or 200 be equally valuable? A decisive answer to inquiry for the lowest point beyond which economy again diminishes would be useful to those who are contemplating a downward revision of declared value.

Another interesting claim at Prestonpans is that, notwithstanding the disadvantages attendant upon intermittent working, and with charging intervals of two hours, the product is so even in quality that it can be turned direct into the district mains. The quality might reasonably be supposed to vary according to the age of the charge, as it does in retorts. A claim in favour of continuous charging is that it secures practically a straight line on the recording calorimeter diagram. When making straight coal gas, a two-hour charging interval means a variation extending over a range of 10 to 20 p.ct., and consequently hourly charging is preferred when practicable. The best gas follows a new charge, and the quality steadily falls until it is replaced by the next, and the same cycle is repeated over each charge. Working in and out of the same holder, and with three or four hour intervals, the variation may be uncomfortably evident in the district.

Hardly 10 p.ct. of the Orders granted under the 1920 Act include a declared value below 450 B.Th.U., which shows that while many believe in the cupola system as an auxiliary, only a small minority are inclined to dispense entirely with the retort. Freedom as to choice of declared value was expected to lead to drastic changes in carbonizing plant and methods; but after nearly four years' experience, the majority have not made any important alteration in the quality of gas supplied.

GAS FURNACE TESTS.

By A. J. SMITH.

In another field of engineering, the steadily growing dissatisfaction with the British boiler-testing code has recently resulted in the formation of an authoritative committee to undertake its revision. The formation of this committee and the inclusion thereon of members of the Institution of Gas Engineers will come as a timely reminder to the gas engineer of the unsatisfactory manner in which many gas furnace trials are recorded. Many of the test figures one is privileged to see from time to time are meagre, and the method of tabulation unfortunately not only varies between one authority and another, but frequently the same authority or manufacturer appears to use a different form for almost every trial. One is forced to the conclusion that there can be no recognized standard form for recording the performance of industrial gas apparatus, as a perusal of the pages of many publications and technical papers will reveal results which are presented in two or three different ways in as many pages. There is also occasionally a perplexing difference in nomenclature of such apparatus; for one finds many engineers using the terms "oven furnace" or "muffle furnace" indifferently, irrespective of whether the apparatus is fitted with an interior lining or muffle for excluding the products of combustion from the work to be heated, or whether the apparatus permits the free circulation of these gases through the heating chamber.

The variety of forms in which results are tabulated involves an immense amount of work to the investigator who is seeking the best type of furnace for his needs; and unfortunately the haphazard way in which certain data are included in some records, while omitted from others, occasionally does the cause of gas a disservice with the sceptical, who are liable to form the mistaken opinion that in many of the published reports of the performance of gas apparatus certain vital details are purposely omitted lest their inclusion should put a different aspect upon the question of running costs. This is a point which, needless to say, is laboured to the utmost by all advocates of rival systems of heating; and it is worthy of note that the example set by the gas industry in its efforts to popularize the use of gas for many industrial operations is being copied by the oil interests, who are making intensive efforts to extend the use of fuel oil, especially in many metallurgical processes.

To anyone even slightly interested in the industrial applications of gas, in the efficiency of the furnaces employed, and the comparative working costs with various classes of fuel, the need has long been apparent for some standard form or code compiled by an authoritative body which would facilitate the recording of results in a systematic manner. Naturally the preparation of a thoroughly comprehensive and up-to-date code would be a lengthy operation, necessitating adequate consideration by a number of authorities; for both the gas engineer and the gas manufacturer, as well as many large consumers, would have their own ideas as to the manner in which any comprehensive trial should be undertaken. However, the arrangement of a rough code for general commercial purposes, which would give in readily accessible form the principal characteristics of any industrial gas apparatus, would not be such a lengthy matter. If such a form could be compiled and issued under the authority of any well-known association or society concerned with the interests of the gas industry, it would be the means of putting future records relating to gas trials upon a very much better footing than those of the past.

If such a code were evolved, its wide distribution among all ranks of workers in any way concerned with the use of gas in industry could be made to result in a considerable flow of useful records to any central authority issuing the forms, as there are large numbers of operatives who, with a little guidance on the subject of gas consumption and its relation to output in different metallurgical processes, and a little instruction on the subject of exact information and records, could add materially to the information already available. It is not the least of the merits of gas apparatus that the fuel consumption is easily obtainable without the complicated and lengthy system of weighing or gauging that is necessary with either solid or liquid fuel; and considering the readiness with which the gas rate can be ascertained in so many cases, an effort to encourage operatives in exact observation of the consumption in relation to output would be useful in furthering the cause.

The writer had not long been connected with the industry before he realized the vital necessity for a standard code for recording the principal characteristics of furnaces and similar

apparatus, if such results were to be co-ordinated and rendered easily accessible, especially when the number of such records began to run into hundreds. After experiment with one method and another, he finally fixed upon the following arrangement of items as the most convenient for commercial purposes:

Operation and temperature . . . . . .
Material treated . . . . . .
Type of furnace . . . . . .
Fuel used Calorific value . . . .
Fuel pressure Air pressure . . . . .

Consumption.

Total fuel consumption over ..... hours . . . . .
Fuel consumption for heating-up furnace from cold. .
Average fuel per hour (including heating-up period) .
Average fuel per hour (excluding heating-up) . . . .
Average fuel per 100 lbs. output (including heating-up).
ditto (excluding heating-up).

Output.

Total material heated over ..... hours. . . . . .
Time taken for preliminary heating-up . . . . . .
Average time to heat charge. . . . . .
Average output per hour (including heating-up) . . .
ditto (excluding heating-up) . . .
Output per sq. ft. of oven area per hour. . . . . .

Sundry Data.

Cost of fuel . . . . . .
Power required for air blast . . . . . .
Cost of ditto . . . . . .
Average life of lining . . . . . .
Average life of crucible or muffle . . . . . .
Melting loss . . . . . .
Labour costs . . . . . .
Location of trial _____
Date _____

It has been found in practice extending over a number of years that this arrangement can be used for tabulating all furnace results, no matter whether the method of heating be gas, oil, solid fuel, or electricity; and it can be used with practically no modification for the records either of melting operations in the foundry or of heat-treatment processes in the tool-room and elsewhere. Records tabulated on these lines, moreover, lend themselves to classification according to the process, the metal treated, the temperature, or the type of furnace employed, whichever may be deemed the most convenient from the user's point of view.

FIRST WORLD POWER CONFERENCE.

GAS AND FUEL SECTION.

(*Continued from p.* 457).

WE continue the report of the proceedings at the meeting on July 7 of the Gas and Fuel Section of the First World Power Conference at Wembley, over which Mr. D. MILNE WATSON presided.

THE GAS ENGINE.

By Prof. F. W. BURSTALL.

[Extracted.]

In some cases the great war stimulated to a remarkable degree the developments in engineering science, as, for example, in the aeroplane engine, but there are other instances in which the war has brought progress almost to a dead stop. This particularly applies to the gas engine. The wide publicity which was given to the failure of several large gas-engine installations had, before the war, caused engineers to look askance at the gas engine. The small engine working on town gas was still called for, but the increasing demand for electric power caused the gas engine to be less frequently used in this country. There is no doubt that the remarkable developments of the steam turbine, its high economy and its capability of being built in such large units, has caused all engineers to look with disfavour on the large gas engine; and to-day it is difficult to get any engineer to consider seriously the possibilities of developing power by means of a gas engine in competition with the modern high grade steam turbine. It is as well for those who have studied internal combustion problems to face these facts frankly and to recognize that developments along the lines of the past twenty years are not likely to lead to success in the construction of large size gas engines. At the same time the steam engine makers should understand that no vapour engine, either a turbine or reciprocator, has the potentialities of high economy which is inherent in the internal-combustion machine.

In the case of the steam engine, the limits of possible economy are being gradually approached. The increase of the steam pressure up to 1200 lbs. to the sq. in., dust firing of the boilers, the use of hot air for combustion purposes, the bleeding of the turbines for feed heating, are all correct theoretical devices, and they are producing economies, but in each case the gain becomes a smaller percentage of the whole. The figure which Mr. Pearce, of Manchester, gives as the ideal from coal to bus-bars, is 23 p.ct. At the present time, one must admit that the ordinary producer and gas-engine plant cannot surpass this figure, and that therefore the attention of the large gas-engine makers has been directed towards the utilization of blast-furnace gas and coke-oven gas. In certain other cases waste fuels such as saw-dust and shavings are being gasified, and attempts are being made to utilize peat as a fuel.

The present-day gas engines up to 150 H.P. per cylinder all follow very closely the standard lines—that is to say, the horizontal engine with the overhung cylinder on the lines first developed in this country by Messrs. Crossley Bros., and the Otto Deutz. The governing is almost invariably effected by altering the travel of both the air and gas valves. The inlet and exhaust valves are vertical and opposite to each other and operated by rocking levers from cams. The ignition is by means of the magneto. Such engines have a compression of from 110 to 130 lbs. per sq. in., corresponding to a compression ratio of 5·5 to 6. The piston speed is from 800 to 850 ft. per minute, and the thermal efficiency of the brake from 26 to 28 p.ct. Engines of this type are absolutely reliable when working on either coal gas or suction producer employing either anthracite or coke as a fuel. They run extremely smoothly, require little or no repairs, and are economical in oil. At the same time there has come into use the vertical gas engine having a rather higher speed of rotation. The best known of these engines in this country is that manufactured by the National Gas Engine Company, who have constructed a large number of these engines up to as much as 1500 H.P. on a single shaft. Here the large cylinder is avoided by using a 3, 4, or 6 crank engine with tandem cylinders in each line, so that in no case is there a larger cylinder than 18 or 19 in. This renders unnecessary the piston cooling which is absolutely essential in all cases where the cylinders exceed 20 in. in diameter.

The vertical high speed gas engine made by the National Gas Engine Company is a remarkably sound and robust proposition, and it deserves to be much more widely used in this country for blast and coke oven gas than is the case at present. For the most part, the large engines (*e.g.*, 500 H.P. and upwards) have followed the line of continental practice—that is to say, tandem double-acting cylinders. The piston is water cooled, and the weight of the piston carried upon three sliding cross-heads. A good example of this type of engine is that manufactured by Messrs. Galloways, of Manchester, who have constructed engines up to 42 in. in diameter and nearly 50 in. stroke—that is, 1500 H.P. These engines run at about 90 r.p.m. The drawbacks of the large slow speed gas engine are its great weight, its slow speed, and its heavy inertia stresses due to the water-cooled pistons and rods, together with the high capital cost. The double acting engines in the large sizes are subject to overheating, and therefore comparatively low pressures have to be employed. My own experience with such engines up to 2500 H.P. in two cylinders was that they would only operate with mean pressures in the neighbourhood of 50 lbs. per sq.in. on the piston; any attempt to increase this led to overheating and difficulties. A number of engines of this type, but without the cross-heads, have been constructed by the Premier Gas Engine Company, of Sandiacre, and these have proved very successful.

One of the most interesting and ingenious developments of the large gas engine in this country is the Premier double-acting vertical gas engine in which there are four cylinders driving on to a single crank by means of a triangular connecting rod. This device was introduced in the large vertical steam engines, and was found to give a remarkably even turning movement, the cylinders being comparatively small. An engine of this type, of 1000 B.H.P., has been constructed, and works satisfactorily on blast-furnace gas.

The most remarkable recent development of the slow-speed horizontal gas engine is due to Messrs. John Cockerell, of Belgium. This firm were among the first to build double acting gas engines in the early nineties, and they have continued their experiments in a manner which does the greatest credit to their perseverance and ingenuity. Just before the war, a large double acting four cylinder gas engine was constructed by them for use in their own works. This engine was returned from Germany after the war, and has been in operation since that time. It is remarkable in being the largest unit which has yet been constructed (8000 H.P.). A singular feature is the fact that only two bearings are employed and the cranks are overhung, necessitating the use of a bayonet-type main frame. The use of two bearings is resorted to in order to get rid of the difficulties due to lack of alignment in three bearings, which leads ultimately to difficulties with regard to a built-up crankshaft. There is little doubt that fractures have occurred due to lack of alignment. The only drawback is the large size of the crankshaft, which, in the case of the 8000 H.P., is 40 in. in diameter and 35 in. in diameter in the main bearings. The piston-cooling difficulties have been got over in a most ingenious manner by a forged-on flange on the piston rod, and bolting the piston, which is in two halves, direct to this flange. This enables the water cooling to be positive, and puts no stress on the cast-iron piston itself. The diameter of these cylinders is 52 in., and the piston speed 940 ft. per minute. Such engines are used with exhaust boilers and give some 2 lbs. of steam per H.P. per hour. An interesting feature of the Cockerell engine is the use of the kinetic energy of the exhaust to produce a scavenging effect in the cylinder, a system first brought out by Messrs. Crossley Bros., many years ago. This is effected very simply by opening the air valve before the exhaust valve closes and while the gas valve is still closed. The high velocity of the exhaust

draws a charge of air into the cylinder, and sweeps out the burnt products. In this simple manner, Messrs. Cockerell have increased their main pressure from some 70 to 100 lbs. per sq. in.

It will now be necessary to consider in some detail difficulties which have been experienced in the gas engine, with the object of seeing whether it is possible to indicate the general lines of an engine which shall avoid these difficulties.

The great difference between a steam engine and a gas engine lies in the fluid used to convert heat into work. The steam is delivered direct to the engine at a known temperature. In the latter case the work has to be produced by chemical reaction, and the temperature is not under the same ease of control as with the vapour of a liquid. In the steam engine the temperature rarely exceeds 700° to 900° Fahr. The flame temperature in the gas engine is, on the other hand, rarely below 1400° C. and often approaches 2000° C. The control of these temperatures and the very high pressures which are consequent upon them, is the whole difficulty in the construction of the large gas engine. At the same time, of course, economy is the result of the high temperatures; and hence no attempt should be made to reduce the temperatures provided the range of temperature can be utilized properly.

From the earliest times to the present day, the material in use for all engines has been cast iron, with the exception of the moving parts such as shafts and connecting rods. So long as steam was being dealt with, this led to no difficulty, and in the internal combustion engine it proved an admirable material until the cylinders reached a certain size—roughly, 20 in. in diameter. When it was determined to increase the cylinder diameter in order to secure the necessary strength, the thickness of the wall had to be increased. As in the internal combustion engine the parts exposed to the hot gases have not merely to resist pressure, but have also to conduct heat to the water jackets, difficulties were at once experienced. All the problems in the large gas engine have been due to this one fact—cast iron is a weak material, and is not capable of resisting high stresses. Probably in the best forms, a stress should not exceed 2500 lbs. per sq. in., and in frames and bedplates not more than half this value. In the larger gas engines, the wall sometimes reaches as much as 2½ in. thick, and this makes it extremely difficult to prevent hot spots and pre-ignition. In the small engines, such for example as those employed in the motor car, very high temperatures are made use of in order to obtain the power; and as the walls are thin, there is little or no difficulty in preventing pre-ignition. Until gas-engine makers are prepared to abandon the use of cast iron for cylinders and combustion chambers, there will not be any advance in the gas engine. Cast steel has been employed in a few cases without any very great success. The only material which will eventually withstand the high stresses is forged steel. This can be made thin enough to conduct away the heat without any difficulty; and thus many of the troubles which the large cylinders experience can be done away with. In my opinion, the maximum thickness for the cylinder walls is 1½ in. This is sufficiently strong, when constructed in a suitable form, for a cylinder 55 in. in diameter, even when a high compression is employed. The combustion chamber should be hemispherical, and the number of valves need not be confined to the customary two, inlet and exhaust, as it would be preferable in this case to use four valves. The water jacket should be looked upon as a mere shell put on to hold the water in position, and should not form an integral part of the engine itself. It is, of course, obvious that such a construction is expensive, but it is perfectly practicable. An engine has been constructed on these lines, and has worked with the highest economy and reliability. The bedplate should be entirely done away with; the cylinders being connected to the main bearings by steel tension rods, which would transmit the whole of the stresses of the explosion direct to the shaft. The only cast iron in such an engine need be the slipper on the piston which of necessity must be of this material in order to work satisfactorily on the steel liner. An engine of this form would be not more than one-third of the weight of the present engine, it could be run at a piston speed of 1000 ft. per minute, and it would be preferable to use a rather higher speed of rotation than is customary at present. The double action is undoubtedly a step in the right direction. The piston valves and all parts which require cooling, other than the combustion heads, the jackets, and the barrel, are all best cooled with oil, which is far the most suitable fluid for carrying through water pipes. An engine of this type should be capable of being constructed to give 1500 H.P. for each cylinder end—that is, 3000 H.P. per cylinder, and 18,000 on a six-cylinder engine.

I see no reason to suppose that it is impossible to obtain on such an engine a thermal efficiency of 36 p.ct. on the brake H.P. With the addition of exhaust boilers for the generation of steam it should be possible to raise this figure to 40 p.ct.—a figure which I need hardly say is far in excess of anything which is possible with the steam turbine. The greatest opening for the large gas-engine is in combination with the blast-furnace and the coke-oven.

As regards both the reciprocating gas engine and the gas turbine, there is the question of the utilization of waste heat discharged in the exhaust. Regeneration as applied to the heat engine was first suggested by Stirling, nearly one hundred years ago in connection with the hot air engine, and the failure of his projects were due only to the difficulties of material. Nearly fifty years later, regeneration was successfully applied to the steel furnace in order to increase both the temperature and the efficiency; and since that time, regenerative furnaces have been used for innumerable purposes.

In the steam engine, the temperature at which heat is rejected is too low to render it economical to apply the regenerative principle, though attempts of a similar type were made by means of the binary engine using sulphur dioxide as the second fluid. It is now generally recognized that in the turbine, where the low-temperature range is particularly valuable, the whole of the heat which can be turned into work is best extracted from the turbine shaft itself.

In the internal combustion engine, the initial temperatures are very high, and the range of expansion is limited by the use of one cylinder, so that the temperature of rejection is of necessity high—an average figure being some 700° C. Two methods of utilizing this waste heat at once suggest themselves. The first and most obvious course is to follow the example of the steam engine, and effect the expansion in two stages. This, however, is now generally recognized as unsuitable, as the internal-combustion engine works with a permanent gas whose specific heat is comparatively small compared with the latent heat which is liberated when steam is expanded. Any attempt, therefore, at compounding can only be done if there is only a small fall of pressure when the gases are liberated from the first cylinder, or, to put it another way, where the temperature is high but the pressure is too low to be utilized in a reciprocating engine. The same remark applies to the discharge through a nozzle in the blades of a turbine. For this to be effective, a considerable back pressure would have to be put on the engine, and no economy would be secured. In nearly all large gas-engine installations, the exhaust gases are used for the purpose of generating steam; and in this manner some 2 lbs. of steam can be raised for each horse-power developed by the main engine. Looked at from the point of view of power, if this steam is used in an engine, the amount of power obtained is not considerable; and therefore, while the exhaust boiler may be a most useful adjunct, the thermal efficiency of the entire plant would not be materially raised. The combination of internal combustion and steam is faulty, mainly because the temperature of the steam is too low in comparison with the temperature of the working fluid.

Another method of applying regeneration is to discharge the exhaust gases into a chamber filled with perforated bricks of the same type as that used in the steel furnace. These chambers are used alternately in exactly the same manner as in the steel furnace, and a very considerable amount of heat can be stored in the bricks. The difficulty is to get any portion of this heat back again into the power producing system. The most obvious course is to heat the incoming air and gas, and thereby increase the temperature. This method, however, is entirely wrong, as is well known to every gas-engine maker, because it reduces the volumetric efficiency of the engine to a marked degree. The incoming air and gas to the engine should be as cold as possible, so that the charge weight may be a maximum.

In order that the gas engine shall be a successful competitor of steam, it must be very much more economical. As in itself it is obviously a more complicated machine, there seems no chance whatever of the gas turbine satisfying this condition, and hence we must rely on the reciprocating engine. Where blast-furnace or coke-oven gas is available, it is certain that gas engines will be employed, and that the demand will be for a fairly large unit, certainly 2000 H.P. This problem may be said to have been solved by the large slow-speed double-acting engine which is sure to have a wide field in this connection, the only drawback to it being its high initial cost, and great size and weight. The alternative is the light high-speed multi-cylinder engine, and I confess that I favour this solution. There is no difficulty of running at from 300 to 400 r.p.m.; and the multi-cylinder engine can be made at a much lower capital cost than the large cylinders, providing that in lieu of cast iron, steel is substituted, when it will be found that wherever the pressure and temperature have to be encountered, the difficulties due to lack of strength will almost vanish. To what extent gas-engine makers are prepared to face such a radical change I am not prepared to say, but I am perfectly certain that the present form of construction with a complicated cast-iron breech end is unsuitable. For the large-size cylinder I should fix the upper size of the cast-iron cylinder in the neighbourhood of 18 in., and should prefer it smaller. The small gas engine at present has a serious competitor in the electrical motor, which has simplicity and ease of handling greatly in its favour. In the near future we may expect a wide extension of cheap electric supply, and it is hoped that those responsible for the gas industry will realize the importance of supplying gas for power purposes at rates which will enable the gas engine to compete on an economic basis. In foreign countries there is also the heavy oil engine, which is a remarkably fine thermo-dynamic machine. I trust my words will not be misunderstood as being in any way a reflection on the future possibilities of gas engines. I am merely facing the problem of the present conditions. *That the gas engine must ultimately be the future source of the power supply is certain;* it will do this by reason of its high efficiency, but it may be that gas engineers will have to wait for this until humanity is becoming really anxious on the subject of fuel.

The turbine is probably nearly at the height of its efficiency; the gas engine is only just commencing. It therefore behoves us to examine most carefully all the possibilites that are ahead of internal combustion. The use of carbon oil fuel is no solution, as it is certainly not as plentiful as coal and will most surely be

worked out long before the coal has become highly expensive to work. Developments should therefore take place at present in the utilization of waste gases, and engineers should endeavour to improve the producer so as to get a more efficient and cleanly plant. If this is done, there is little doubt that there will be a wide field for the development of the gas engine.

Prof. F. W. Burstall, in introducing the paper, said: I should like to add a few words on the part of my paper which seems to me so important—namely, that the engine of the future must decidedly be of a lighter and very much stronger character than we have had in the past. At one time I thought the big slow-speed engine was the correct form, owing to the fact that it had been developed very satisfactorily abroad. It has now, however, been brought home to us by sad experience that such engines are liable to many misfortunes to which smaller and lighter engines are not liable. I therefore determined to reduce the thickness of the walls to a degree not hitherto reached, and have now constructed an engine in which the walls are of forged steel ½ in. thick, with the result that much higher temperatures and pressures can be handled with impunity.

The other point is the question of the gas turbine. My steam turbine friends are always asking me, "Why cannot you make a gas turbine?" It seems very difficult to get engineers as a whole to realize, what my old friend Sir Dugald Clerk laid down years ago, that the gas turbine will of necessity be an inefficient machine. The difficulty is that the compressor must be a rotary one. The efficiency of the gas engine is its important feature. We have not yet reached the limits. It is possible, and it will be done in a few years, to get 36 p.ct. of the heat of the gas appearing as motive power on the shaft, in comparison with the best that the steam turbine has yet done of 23 p.ct., and this is in the case of a comparatively small motor. We must remember that a gaseous fuel—and I speak as one having charge of steam, gas, and oil plants—is the most perfect fuel of all. You can handle it in a way you cannot deal with solid or pulverized fuel. I once injected pulverized fuel into a gas-engine cylinder. It is possible, but finally the dust forms a coating that stops the engine.

Discussion.

Sir Dugald Clerk said that, like Prof. Burstall, he had been engaged for a long time on experimental and manufacturing work in connection with the gas engine. About twenty years ago, he happened to be President of the Junior Institution of Engineers, and many of them wanted to go in for gas and petrol turbines, and so he thought it would be just as well to show them what the real difficulties were. He could do this, because Sir Charles Parsons and he had co-operated many times, and had discussed the question of the gas turbine very often—and, indeed, had made a good many experiments to see where they were. In this Presidential Address, he pointed out that one could not make a gas turbine upon the principle of Parsons, because that meant immersing the whole of the blades in flame, and the flame could not be worked at less than 1400° C. One could not make a turbine of this type. The only type that could be operated without breaking down was an impulse turbine, with perhaps two rows of impulse blades. But if one started with low pressure explosions, with very strong mixtures giving 1700° C., one could not get more than about 90 lbs. The consequence was that, without compression, one could see it was impossible to get anything like high economy, and compression was absolutely necessary in engines of the turbine type. The real difficulty about compression was the one that Prof. Burstall had alluded to. He (the speaker) read a further note on this subject before the British Association in 1912. Then Holwartz sent over some figures, and he (Sir Dugald Clerk) came to the conclusion that there must be some mistake in the efficiencies. Instead of making it 20 p.ct. efficiency, he could not make more than 12 p.ct. Holwartz rather got round to the rear of the difficulty about compression by using steam to produce the compression. He (the speaker) had heard a good deal about the present turbine, and had had results sent over to him; but he was by no means convinced that Holwartz had overcome the difficulties. The efficiencies were much too low. The great beauty of the cylinder compression gas engine was that one compressed in the same cylinder as one was going to ignite in, and one got an efficiency of compression that was extremely high—it might be 95 or 96 p.ct.; whereas with the very best rotary type of turbine one could not get the high efficiency of compression, and this was fatal. He heard from Sir Robert Hadfield that he had just developed a new steel which retained its full tensile strength at 900°; and if this was a workable material it put a new aspect on the gas turbine, but it did not get over the difficulty of compression, which was really the weak spot. With regard to the earlier portion of Prof. Burstall's paper he (the speaker) had had to consider whether the companies he was interested in would build large cylinder gas engines; and he came to the conclusion that the Germans had rather overlooked one fundamental law. The National Gas Engine Company made up their minds to build a large multiple cylinder engine with a number of cranks, and they had never gone higher than 150 or 170 H.P. per single cylinder. This was very successful, and they had now running about 100,000 H.P. He wished Prof. Burstall's new engine every possible success.

Prof. W. A. Bone said that when he came to a discussion of the subject of coal or fuel, he did so rather to hear what other people had to say than to contribute anything himself, and it had been so on the present occasion. As a chemist, he would like to remind everybody that coal was a substance extremely complex in its nature, of which they knew at present next to nothing. It was as flexible as it was complex, and the question was how, in any particular set of circumstances, it should be handled to the best advantage. He did not think they could lay down any general law that it should be handled in any particular way in all circumstances. The gas industry carbonized the coal very efficiently, and he supposed there was no process from the point of view of thermal efficiency which could be rated higher than the carbonizing of coal as carried out in gas-works at the present day. They had, perhaps, not yet reached the highest limit possible, but they had got somewhere near it. With regard to the question of the temperature at which one should carbonize coal—and they had heard a great deal about low-temperature carbonization—this depended entirely, he thought, upon the market values of the products obtained from it. If one compared low-temperature products to-day with the products that were to be obtained from the same coal by high temperature carbonization, he very much doubted whether it was more economical at the present time to carbonize at a temperature materially lower than that which was customary in the gas-works. ("Hear, hear.") He had seen no figures yet, and certainly no practical results, which would make him an advocate of low temperature as against the temperatures employed in gas-works carbonization. Possibly, if economic conditions—that was, the relative values of the substances produced from coal—were to change considerably, another story might have to be told; but at present the difficulties with regard to low-temperature carbonization were to his mind sufficiently formidable to make it a very doubtful proposition, with the relative values of the tars and gas, and of the residue, as they were. It sometimes astounded the economists to see some of the statements made in the popular Press as to what enormous economies could be effected by some postulated method of treating coal. Coming to this meeting, he saw a statement in the papers to the effect that, if they could produce all their power electrically—electrify all their railways, and produce electrically all the power required for the factories in this country—they would save something like 55 million tons of coal a year. He would regard this statement as purely fantastic. ("Hear, hear.") He should think it would be nearer the truth if one said 15 millions, and possibly nearest the truth if one said about 10 million tons of coal. He made this remark in order that the public at large might be cautioned against the reception of some of the statements which were made, and were being promulgated in the Press, at the present time on this question. He hoped to witness a considerable development in the better organization of electrical power in this country; but he saw no prospect whatever, if the whole of the power utilized in the industry of the country were generated by electrical methods, of saving in coal much more than, if even as much as, from 10 to 15 million tons per annum. One of the great problems in this country was the future of domestic heating. They wanted to see the abolition of the use of raw coal, if possible. He believed a great deal more could be done in the substitution of gaseous combustion in houses by means of gas fires and gas cookers. There was an immense field yet to be developed. He would welcome the day when they could produce economically a smokeless fuel which could be burned in the open fireplace; there was a field for both this and gas. But at the present time he saw no process for the production of smokeless fuel by low-temperature carbonization for domestic purposes which was likely to give, on an economic and commercial balance-sheet, a smokeless fuel at anything like the price of raw coal. Now, as a scientific man, he would like to put in a plea for further fundamental research on the subject of coal itself. As he had said at the outset, it was a very complex material, and as yet they knew very little indeed about it. What they might be able to do with coal fifty years hence, he could not say, but he did say this—that what they would do at that time largely depended upon their applying themselves more than they had done hitherto to trying by research to solve some of the problems as to the constitution and character of coal itself. The solution of these problems really lay at the root of the future use of coal, and if this conference could stimulate in any way research into the fundamental character of coal, and the possible new methods of handling it—he did not mean mechanically, but chemically—for the good of the community as a whole, it would have effected a useful pupose. But until they knew much more than they did at present about coal itself, it was impossible to make any really justifiable forecast of what coal would be capable of in the future. They were working very largely empirically, and without the scientific knowledge which was needed.

The Chairman remarked that, if no one else wished to say anything, the session, which had been most interesting, was closed. They had had a great many interesting contributions to the three problems of efficiency of manufacture, efficiency of supply, and co-ordination and co-operation. What they had heard would help them to form their minds. Many fresh problems had been raised in the course of the discussion, and it was obvious that they were only at the beginning of solving some of the points discussed. They would not like to close the meeting without expressing, on their behalf, deep indebtedness to the readers of the papers for the trouble they had taken in the preparation of them. He hoped the papers would not be lost, but would really be bread cast upon the waters which would return and do good. He moved a very hearty vote of thanks to the authors of the papers, and to those who had taken part in the discussions. [Applause.]

Mr. D. T. Livesey: I should like to propose a hearty vote of thanks to Mr. Milne Watson for presiding. [Applause.]

Canadian Gas Association Meeting.—The seventeenth annual convention of the Canadian Gas Association takes place at Toronto on Thursday and Friday, Aug. 28 and 29.

A.G.A. Meritorious Service Medal.—The American Gas Association announce the establishment of a Meritorious Service Medal, the gift of Mr. Walter R. Addicks, Vice-President of the Consolidated Gas Company of New York. The idea is to promote safe service in the gas industry. Not more than one medal is to be awarded annually for the period covered by the prior calendar year—provided a meritorious action was performed. It is to be bestowed only upon one who has shown meritorious and conspicuous judgment, intelligence, or bravery in saving human life, either in the plant or works of any gas undertaking or having to do with the handling of the materials of manufacture or of the products manufactured or distributed.

INTERNATIONAL COMMISSION ON ILLUMINATION AT GENEVA—JULY 22, 1924.

[*Photo. by Boissonnas, of Geneva.*

First row standing—Dr. Sharp (U.S.A.), Mr. W. T. Dunn and Mr. R. Watson (Britain), Mr. C. O. Mailloux (U.S.A.), M. Blondin (France), Herr Trub (Swiss), Dr. Kerr (Britain), M. P. Bossu (France), Dr. Crittenden (U.S.A.), Mr. T. Yamamato (Japan).
Sitting—M. Fabry (France), Mr. Gaster (Britain), Mr. Lieb (U.S.A.), Col. Edgcumbe, Vice-President (Britain), M. Filliol, President of Swiss Committee (Switzerland), Dr. Hyde, President (U.S.A.), Prof. Vautier, Hon. President (France), Mr. C. Paterson, Vice-President (Britain), Sig. Bohm (Italy).

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C. F. Botley, Hastings.
T. Hardie, London.
W. E. Price, West Chobham.
J. D. Smith, Belfast.
Samuel Tagg, Preston.
J. Wilkinson, Nottingham.

FINANCE.

J. Ferguson Bell, Derby.
C. F. Botley, Hastings.
J. M. Campbell, Margate.
H. Davies, Chesterfield.
T. Hardie, London.
L. J. Langford, Tunbridge Wells.
W. E. Price, West Chobham.
C. S. Shapley, Leeds.
J. D. Smith, Belfast.
Samuel Tagg, Preston.
John Terrace, Lower Sydenham.
John Wilkinson, Nottingham.

GAS HEATING, LIGHTING, AND VENTILATION.

Institution.

John Bond, Southport.
C. Dru Drury, Sunderland.
H. Pooley, Leicester.
S. Tagg, Preston.
Chas. Wood, Bradford.

Leeds University.

John W. Cobb, Leeds.
J. B. Cohen, Leeds.
A. Smithells, London.
G. R. Thompson, Leeds.
C. S. Shapley (co-opted), Leeds.

Gas Investigation.

J. Ferguson Bell, Derby.	D. H. Helps, Reading.
J. E. Blundell, Carlisle.	J. W. M'Lusky, Glasgow.
John Bond, Southport.	H. D. Madden, Cardiff.
C. F. Botley, Hastings.	H. Pooley, Leicester.
A. E. Broadberry, Buckhurst Hill.	W. E. Price, West Chobham.
Chas. Carpenter, London.	T. F. E. Rhead, Birmingham.
J. W. Cobb, Leeds.	C. S. Shapley, Leeds.
J. B. Cohen, Leeds.	J. D. Smith, Belfast.
H. G. Colman, London.	W. J. Smith, Bolton.
C. Dru Drury, Sunderland.	A. Smithells, London.
E. V. Evans, London.	Samuel Tagg, Preston.
W. Doig Gibb, London.	G. R. Thompson, Leeds.
Samuel Glover, St. Helens.	Chas. Wood, Bradford.
T. Hardie, London.	

Albert Parker, D.Sc.
James W. Wood, M.Sc. } Research Chemists.

Sub-Committee on Standard Method of Testing Gas Cookers.

C. F. Botley, Hastings.	W. E. Price, West Chobham.
A. E. Broadberry, Buckhurst Hill.	W. J. Smith, Bolton.
E. V. Evans, London.	Samuel Tagg, Preston.

Co-opted.

Dr. H. Hartley, London.	A. Forshaw, Falkirk.
J. G. Clark, London.	J. W. Wilson, Leeds.

Refractory Materials.

Chairman and Hon. Secretary, *J. P. Leather, Letchworth.

Institution.	*Society of British Gas Industries.*
J. Ferguson Bell, Derby.	T. Allen, Dudley.
J. W. Cobb, Leeds.	M. Barratt, Leeds.
H. G. Colman, London.	F. H. Brooke, Oughtibridge.
*Thos. Hardie, London.	Albert Cliff, Stamford.
D. H. Helps, Reading.	G. V. Evers, Stourbridge.
P. N. Langford, Coventry.	J. W. Fagan, Friden.
*W. E. Price, West Chobham.	G. H. Pearson Perry, Stourbridge.
H. E. Riley, St. Austell.	
Samuel Tagg, Preston.	
O. Thomas, Pentre.	
J. Wilkinson, Nottingham.	

* On Sub-Committee of British Refractories Research Association.

Representatives on Council of British Refractories Research Association.

J. P. Leather, Letchworth.	W. E. Price, West Chobham.

Wrought Iron Tubing Inquiry.

Albert Stokes (Chairman), London.
R. Hy. Ruthven (Hon. Secretary), Ramsgate.

J. Ferguson Bell, Derby.	W. E. Price, West Chobham.
J. E. Blundell, Carlisle.	Samuel Tagg, Preston.
F. Davies, Walsall.	Frank P. Tarratt, Newcastle-on-Tyne.
Stephen Lacey, London.	

Representatives on the National Gas Council of Great Britain and Ireland.

J. Ferguson Bell, Derby.	Samuel Tagg, Preston.
C. F. Botley, Hastings.	John Wilkinson, Nottingham.

On British Commercial Gas Association.

First Vice-President ex-officio, J. Ferguson Bell, Derby.
Vice-President nominated by the Institution, T. Goulden, Ingatestone.

On Corbet Woodall Scholarship Advisory Committee.

President, J. Ferguson Bell, Derby.
Hon. Secretary, W. E. Price, West Chobham.

John Bond, Southport.	Charles Wood, Bradford.
Charles Carpenter, London.	Henry Woodall, Jun., London.
Walter T. Dunn, London.	

Advisory Committee on the Livesey Professorship of Coal Gas and Fuel Industries at Leeds University.

John Bond, Southport.	T. Goulden, Ingatestone.
Chas. Carpenter, London.	Thomas Hardie, London.
W. Doig Gibb, London.	James D. Smith, Belfast.
Samuel Glover, St. Helens.	Samuel Tagg, Preston.
Thomas Glover, Norwich.	Charles Wood, Bradford.

Livesey Professor.

John William Cobb, C.B.E., B.Sc., F.I.C., Hon.Mem.Inst.C.E.

On National Illumination Committee of Great Britain; also on British Engineering Standards Association Sectional Committee on Illumination.

W. J. A. Butterfield, M.A., London.	Harold G. Colman, D.Sc., London.
J. G. Clark, London.	Robert Watson, Doncaster.
F. W. Goodenough, London.	

Representatives on British Engineering Standards Association: Sectional Committee on Machine Parts, their Gauging, and Nomenclature; on Sectional Committee on Pipe Threads; and on Sub-Committee on Steel Tubes.

Alex. A. Johnston, Brentford.

Sectional Committee on Pipe Flanges, and on Cast Iron Pipes.

A. Stokes, London.	T. Hardie, London.

Sectional Committee on Screw Threads.

Stephen Lacey, B.Sc., London.

Benevolent Fund.

Committee of Management.

J. Ferguson Bell, Derby (Chairman).

R. E. Gibson, Liverpool.	A. Kellock, Airdrie.
E. G. Hutchinson, Richmond.	G. S. Frith, Runcorn.
P. S. Hoyte, Plymouth.	T. Goulden, Ingatestone.

Representing the District Associations affiliated with the Institution.

W. H. Mainwaring, Lincoln.	D. Fulton, Helensburgh.
W. Rogerson, Middleton.	N. S. Cox, Sunderland.
T. Thornton, Rowley Regis.	W. H. Bennett, Redhill.

O. Thomas, Pentre.

Representatives from Finance Committee.

C. F. Botley, Hastings.	T. Hardie, London.

(One vacancy to be filled).

Hon. Auditors.

Wood, Drew and Co., London.	S. Y. Shoubridge, Eastbourne.

Hon. Secretaries.

W. E. Price, West Chobham.	W. T. Dunn, London.

Electrolytic Corrosion in a Water-Gas Holder.

There has been communicated by Messrs. F. H. Rhodes and E. B. Johnson, of Cornell University, Ithaca (N.Y.), to the June issue of "Industrial and Engineering Chemistry," a recent instance of electrolytic corrosion, some features of which were regarded as being sufficiently interesting and unusual to justify the publication of a description of the case. In the outer tank of a relief holder receiving crude gas direct from the water-gas generators, severe corrosion developed throughout a horizontal zone extending from about 4 in. to 3 ft. below the level of the sealing water. All over this area the steel was badly attacked, and many holes (some of them ¼ in. in diameter) had been eaten through the plates. At the same time, there was no evidence of attack at or just below the level of the sealing water, or in the lower part of the tank. Another holder on the same works, which was used for storing a mixture of purified water gas and purified coal gas, gave no evidence of localized attack. It appeared very probable, therefore, that the corrosion was due either directly or indirectly to the presence of some impurity (possibly hydrogen sulphide) in the crude gas. That the corrosion was not due to the simple rusting of the iron by oxygen dissolved in the water is, they say, indicated by the fact that the attack was more severe below the water level than at the surface of the water, where the concentration of dissolved oxygen is greatest. That it was not owing to the simple chemical action of the dissolved hydrogen sulphide on the iron is shown by the fact that the attack was confined to a narrow zone near the top of the holder, though the water near the bottom was in more direct contact with the gas, and should contain a higher concentration of dissolved hydrogen sulphide. Furthermore, the large amount of iron oxide in the scale (89½ p.ct.) indicated that the pitting was not caused by the simple chemical action of the dissolved hydrogen sulphide. The observed facts may be explained by the assumption that the corrosion was electrolytic in character; the required difference of potential for the electrolysis being produced by an oxidation-reduction cell. The water at the top of the holder contained some dissolved oxygen, and the iron shell in contact with this oxidizing solution formed the cathode. The water at some distance below the surface contained dissolved hydrogen sulphide, and possibly other active reducing substances, so that the iron shell in contact with this reducing solution formed the anode. Subsequent experiments showed that the corrosion was essentially electrochemical in character; the point about the case being that the electrolysis was brought about by a single piece of metal in contact with two solutions of different oxidizing power rather than by two different metals in contact with each other and with a single solution.

Visit to the Fuel Research Station.—A party of about thirty Members of Parliament, representing mining constituencies, lead by Mr. Shinwell (Parliamentary Secretary to the Department of Mines) and Mr. Charles Edwards (Secretary of the Miners' Group of M.P.'s), visited the Fuel Research Station at Greenwich last week. Dr. Lander, Director of Research, received the visitors, and explained to them the nature of the work carried on at the station. Mr. Edwards said that the problem they were faced with to-day was not that of production. That had already been solved; but the question of how to utilize the results of the workers' efforts still remained, and it was with this that the Fuel Research Board were endeavouring to deal.

Gas-Works Extensions at Montreal.—The "Gas Journal of Canada" says that Montreal will have the biggest gas-producing plant in Canada, and one of the largest on the continent, when the work at present in progress of doubling the Lasalle plant of the Montreal Light Heat and Power Company is completed. Originally intended to be a station with a storage capacity of 12 million c.ft. per day, the big plant near the Lachine Canal at Ville Lasalle will have a capacity of 24 million c.ft. per day when the work is completed, and when projects now in hand have been carried through will store 40 million c.ft. of gas. The feature of the present work is the construction of a 6 million c.ft. holder. The work necessitates the provision of an 8 million c.ft. capacity water-gas plant, &c.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Institution's Examinations in Gas Engineering and Gas Supply, 1925.

SIR,—Will you please allow me the use of your columns to remind all those who, being out of touch with any technical institute, wish to sit for the Institution's examinations in either the Ordinary or Higher Grades in Gas Engineering or Gas Supply next spring, under Section II., that in accordance with the Scheme their application must be sent in by Aug. 31 next. The necessary application forms may be obtained on request either to the Secretary of the Institution of Gas Engineers, No. 28, Grosvenor Gardens, S.W. 1, or to me.

WALTER HOLE,
Organizing Secretary.

Dentdale, Barton, Torquay,
July 30, 1924.

REGISTER OF PATENTS.

Production of Gas.—No. 217,998.

TULLY, C. B., of Newark-on-Trent.

No. 8738; March 27, 1923.

This invention relates to the manufacture of gas, and consists of an improved method of construction of plant, and its working, to enable gas of different qualities to be obtained at will. The plant comprises two single Tully plants in combination, the upper ends of the two jackets surrounding the superimposed retort being in communication with one another and with a valve-controlled gas outlet pipe. The two retorts are provided at their upper ends with valve-controlled outlets.

In order to provide a mixed water gas and coal gas rich in methane and luminous hydrocarbons, the two gas generators are blown in parallel with air, and alternately steamed, as follows. Air blast is admitted to the base or ashpit of both gas generators simultaneously, the resulting blow gas escaping through the nostrils of each combined retort and gas generator into the jackets of the retorts, and thence through the stack pipe. When the necessary temperature has been attained in each generator, the blast is shut off, the stack valve closed, and steam admitted to the ashpit of one of the generators. The resulting water gas is led through the nostrils of this generator and through the jacket of the retort, together with coal gas evolved in the latter retort, the upper outlet of which is then in the closed position so that the coal gas passes downwards through the retort to the nostrils. The mixture of coal gas and water gas is thence led into the jacket of the second retort, through which it descends and passes through the nostrils into the second retort, through which it rises and becomes mixed with the coal gas being evolved therein. The gaseous mixture passes off through the top of the second retort. After a definite time, the generators are again blasted with air in parallel; after which the steam cycle is reversed. The patentee claims that by this method the carbonization of the coal is better assisted, better gasification of the tar and hydrocarbons present results, and richer gas is obtained.

To produce a gas rich in hydrogen and low in methane and other hydrocarbons, the mixed water gas and coal gas, after passing upward through one or other of the jackets and down the other jacket, is, instead of being passed upward through the retort surrounded by the latter jacket, passed downward through the incandescent fuel of the corresponding gas generator and through a gas outlet pipe below the grate of that gas generator; the outlet of the retort above this gas generator being closed so that the coal gas then being produced also passes down through the gas generator below.

Or the coal gas produced in the second retort during the run is drawn off through its outlet, and separately dealt with, while the mixture of water gas and coal gas coming from the other gas generator and retort is passed downwards through the incandescent fuel in the gas generator below the second retort and drawn off through the gas outlet below the grate of that gas generator. With a view to increasing the percentage of hydrogen in the gas obtained, means may be provided for introducing oil or other hydrocarbon into the path of the heated mixture of water gas and coal gas passing from the jacket of either retort to that of the other retort.

In another construction, there is arranged in series with the jackets of the two retorts, two additional cracking chambers charged with chequerwork and connected at their junction with a valve-controlled stack pipe, so that, during the blow period, the hot gases will flow through the two jackets and additional cracking chambers in parallel, and escape by the stack pipe, thereby heating the additional cracking chambers to a high temperature; while during the gas making period, the mixture of water gas and coal gas passing from one gas generator and retort through the jacket of one retort will pass through both of the additional cracking chambers in series, and thence into the jacket of the second retort. The additional cracking chambers may advantageously be combined in the same structure as the two retorts and gas generator. Means may also be provided for admitting oil or other hydrocarbons to the additional cracking chambers.

Apparatus for Automatic Control.—No. 218,370.

BRITISH ARCA REGULATORS, LTD., and LINDSAY, T., both of Westminster.

No. 8989; March 29, 1923.

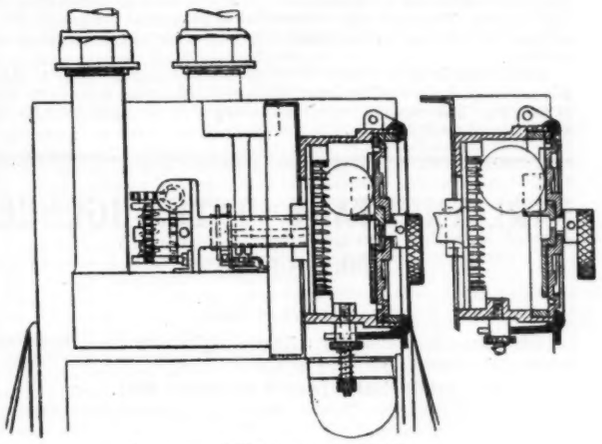
This invention is concerned with the automatic control of a current of liquid, steam, gas, or electricity, of the speed of machinery, of humidity, temperature, &c., by means of an apparatus of the type in which the main regulating device is controlled by the pressure of a non-compressible liquid continually issuing from a discharge aperture, and in which the pressure is controlled by the position of a cup adapted to move freely towards and away from this aperture. The fluid, on its way to the aperture, acts directly on the upper surface of a flexible diaphragm which is adapted to actuate the main regulating device in accordance with the variations in the pressure of the fluid. This arrangement, state the patentees, prevents any impurities from interfering with the actuating member of the main regulating device, and allows of exact control at any temperature without interfering with the accurate working of the diaphragm. The actuating member is constructed so that in one position it opens or advances the main regulating device on the suppression of the jet, while in the reverse position it retards and closes this device.

Prepayment Mechanism.—No. 218,434.

FOX, T., and ROBINSON, S., both of Liverpool.

No. 12,518; May 10, 1923.

This invention relates to a meter which is adjustable for operation with one or other of two coins of different values; the coin engaging directly with the teeth on the quantity wheel, which is held from axial movement.



Prepayment Meter—Fox and Robinson.

A feature of the patent is that the price-changing disc is displaceable into one or other of predetermined positions by means of a fixed or movable distance piece. This distance piece or sleeve may be placed on one or other side of the price-changing disc—adjacent either the outer flange or a stop arranged between the disc and the quantity wheel—by which means the price-changing disc will be axially displaced in accordance with the coin it is desired to use. The coin is inserted in a slot in the price-changing disc, and engages directly with teeth formed on the face of the quantity wheel.

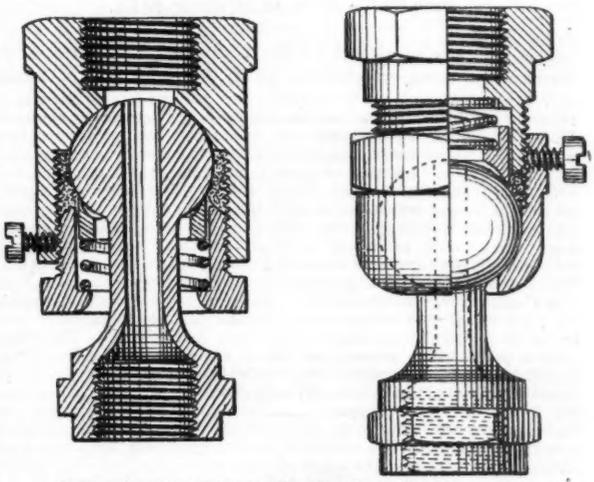
The two positions of the distance piece, and the general construction of the mechanism, are shown in the drawings which we reproduce.

Ball and Socket Joints.—No. 218,449.

EVERED & CO., LTD., and EVERED, S., both of Smethwick.

No. 13,803; May 25, 1923.

This invention relates to ball-and-socket joints for pipe connections, more especially where the joint is intended for use with depending fittings for gas lamps and chandeliers.



Ball-and-Socket Joint for Gas Pendant—Messrs. Evered.

There is combined with a gland nut and annular member a spring support which serves to preserve the annular member pressing firmly against the ball head of the tail pipe while the gland nut is being screwed up for putting the requisite pressure on the packing of the

joint. From the illustrations of two forms of the invention, it will be seen that the gland nut is formed with an inwardly projecting flange to provide a seating for one end of a short coiled spring interposed between the seat and the inner end of the annular member. The outer end of the spring takes a bearing against the inner end of the "telescopic" member, which inner end is or may be recessed to receive it. The annular member is inwardly bevelled or chamfered at its outer end to the curvature (or approximately) of the surface of the ball section.

Gas Burners for Cooking.—No. 218,369.

SOUTH METROPOLITAN GAS COMPANY and CHANDLER, D., both of Old Kent Road, S.E. 15.

No. 8988; March 29, 1923.

This invention relates to improvements in gas burners for use in cooking, of the type in which the mixing tube is arranged on the side of the burner head and outlet passages are formed between a central body and the burner head. The object is to provide means for facilitating the cleansing of the burner, and to prevent backfiring.

A detachable sleeve is provided between which and a central, preferably circular, body are outlet passages in the form of teeth or projections on the sleeve or central boss. The teeth may resemble gear teeth and be formed by milling, or the central body or sleeve may be a die casting. The teeth may be parallel to the axis of the central body, or may be helical so as to impart a rotary motion to the combustible mixture.

The central body is screwed or otherwise attached to the bsse of the burner so as to be readily detachable, and the sleeve is made an easy sliding fit. The central body is provided with an axial hole for the admission of secondary air.

The central body may, if desired, project slightly above the top of the sleeve, which latter may carry a plate adapted to rest upon the top of the central body and serve to deflect the combustible gases.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for July 30.]

Nos. 17,368 to 17,923.

BARRALET, J. H.—"Geysers." No. 17,721.
CURTIS, S. W.—"Gas-mantles." No. 17,631.
EVERED & Co., LTD.—"Means for operating gas-valves, &c., from a distance." No. 17,757.
GEE, A.—See Evered & Co., Ltd. No. 17,757.
JOHNS-MANVILLE, INC.—"Covers for storage tanks for volatile liquids or gases." No. 17,452.
JONES, F. W. S.—"Distillation of coal, &c." No. 17,454.
NEW GEYSERS, LTD.—See Barralet, J. H. No. 17,721.
PARKER, C. H.—See Jones, F. W. S. No. 17,454.
PHILLIPS, T.—"Gas, &c., fittings." No. 17,858.
POTTS, H. E.—"Purification of crude ammoniacal liquors." No. 17,742.
SILVERLOCK, H.—"Geysers, &c." No. 17,787.
STEVENS, R. H.—See Curtis, S. W. No. 17,031.
STOKOE, C. L.—"Safety apparatus for flow of fluids through piping." No. 17,652.
SUTCLIFFE, E. R.—"Distillation of carbonaceous substances." No. 17,640.
TURNER, E., and TURNER & Co., E.—"Means for controlling flow of fluids" No. 17,479.
ZECHE, M. STINNES.—See Potts, H. E. No. 17,742.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Rotherham Corporation Bill: Read the third time, with the amendments, and passed. The Bill received the Royal Assent last Friday.

Public Health (Smoke Abatement Bill).

The Bill was considered by the House in Committee on Friday last, and amendments made.

HOUSE OF COMMONS.

Progress of Bills.

Rotherham Corporation Bill: Lords amendments considered, and agreed to.

Rhymney and Aber Gas Bill: Reported, with amendments.

Manchester Corporation Bill: Reported, with amendments, from the Local Legislation Committee.

Gas Regulation Act.

On the motion of Mr. Albert Alexander, approval was given on the 30th ult. to the drafts of Special Orders proposed to be made by the Board of Trade under section 10 of the Act on the applications of the Sandwich Corporation, Uttoxeter Gas Works, Ltd., Wirksworth Gas Light and Coke Company, and the Kings Lynn Gas Company. In regard to the latter Company, the following modifications were made: Clause 42, sub-clause (8), line 3, after "Company" insert "or a railway committee;" clause 42, sub-clause (8), line 6, after "Company" insert "or committee."

RHYMNEY AND ABER GAS BILL.

This Bill was considered by the Unopposed Committee of the House of Commons, presided over by Mr. ROBERT YOUNG (Chairman of Ways and Means), on Wednesday, July 30, and was ordered to be reported for third reading, with amendments. The proceedings in the House of Lords, where there was opposition by the various local authorities, whose areas were supplied by the Company, were reported in the "JOURNAL" for May 28, June 4, and June 11, pp. 609, 689, 756.

Colonel COX (Messrs. Dyson, Bell, and Co., Parliamentary Agents) said the principal provisions of the Bill were to empower the Rhymney and Aber Gas Company to charge for gas on the therm basis, to change from a maximum price and maximum dividend to a sliding-scale undertaking, to consolidate the capital, and to affirm an agreement with the Powell Duffryn Coal Company, who supply them with gas in bulk. The Company was incorporated in 1898 as a gas and water undertaking; but in 1921 the water portion was sold to an aggregation of local authorities, who formed themselves into a Water Board. The Company at present supplied gas in an area of some 60 square miles in Monmouthshire and Glamorgan. The peculiar feature was that they did not themselves manufacture gas. Within the limits of supply there were the Powell Duffryn Company's collieries, and from them the Gas Company bought coke oven gas in bulk, purified it, and supplied it to the consumers. By reason of this arrangement, they had been able to supply gas over the whole of their area extraordinarily cheaply—so much so, indeed, that there had been no reason to increase the maximum prices throughout the war. Originally the Bill sought to make the basic price and basic dividend system applicable to the Company; but there had been opposition by the local authorities, and the House of Lords Committee had decided that the basic price principle was not suitable to an undertaking of this sort, which was a middle-man concern. Consequently the sliding-scale was adopted, and standard prices were agreed. With regard to conversion of capital, for every £5 10s. share, which to-day carried a maximum dividend of 10 p.ct., there was substituted an equivalent amount of stock carrying a standard rate of 7 p.ct. The latter was the rate actually paid last year. The standard price in part of the area was to be 11·3d. per therm, and in the remainder 12·7d. Those were the prices actually charged to-day, if converted from cubic feet to therms. In the Bill there was a neutral zone of 4d. per therm, and it was also provided that the charge for public lighting should be 10 p.ct. less than that to ordinary consumers. The agreement with the Powell Duffryn Company was scheduled to the Bill, which confirmed the agreement for a further period of ten years, from Jan. 1, 1923. One of the local authorities had petitioned again in the House of Commons, but agreement had been reached. There was a report on the Bill from the Board of Trade, but all the points raised were disposed of in the other House, and the Board now agreed.

The preamble having been formally proved, the Committee ordered the Bill to be reported.

PINNER GAS ORDER.

The "Insufficiency of Mains" Fight with Railway Companies.

The long-postponed fight between the gas industry and the railway companies, with regard to the clause which confers upon gas undertakings the right to refuse a supply for industrial purposes where a main is of insufficient capacity to give it without affecting the service for lighting and domestic purposes, took place in Committee Room No. 11, before a House of Commons Committee, on Tuesday, July 29. It will be remembered that the Pinner Gas Order was, by arrangement with the Board of Trade, specially referred to a Select Committee with the view of the matter being discussed in the hope of arriving at some decision which could be generally adopted in future gas legislation. The Committee was composed of Mr. D. Reid (Chairman), Mr. J. Ward, Capt. Bourne, and Mr. Stanford.

The promoters of the Order (the Pinner Gas Company) were represented by Sir LYNDEN MACASSEY, K.C., and Mr. H. W. BEVERIDGE; while the opponents—the London Midland and Scottish, and other Railway Companies—were represented by Mr. W. E. TYLDESLEY JONES, K.C., and Mr. WROTTESLEY.

The proceedings at the time of the Board of Trade Inquiry into the Pinner Order were reported in the "JOURNAL" for June 18, p. 852.

The result of the discussion before the Committee on July 29 was that the matter has been postponed until the Autumn Session, with a view to the parties arriving at some form of words to meet the difficulty, which, by the way, was narrowed down somewhat as a result of the views expressed by the Committee—namely, that while some form of arbitration was necessary as to the terms upon which large industrial supplies should be given, small industrial users should not be put to this trouble and should have the supply in the ordinary way without question.

Sir LYNDEN MACASSEY, K.C., opening the proceedings for the promoters, said there were two points at issue between them and the Railway Companies. The first one related to clause 21 of the Order, which reads as follows:

> Notwithstanding anything contained in any enactment to the contrary, the Company shall not be obliged to give from any main a supply of gas for any purpose other than lighting or domestic use in any case where the capacity of such main is, at the date when the supply is demanded, insufficient for such purpose, or if, and so long as, any supply for such purpose would in the opinion of the Company interfere with the sufficiency of the gas to be supplied by means of such main for lighting or domestic purposes.

The Railway Companies asked that this clause should be struck out of the Order, but the effect of this would be that the Pinner Gas Com-

pany would be obliged to make provision for any demand for gas of an industrial nature that might be made upon them, and be put to considerable capital expenditure, without any assurance whatsoever of an adequate return or of any permanency in such industrial supply.

The CHAIRMAN pointed out that clause 21 referred only to mains, and did not say anything about supply.

Sir LYNDEN MACASSEY stated that he would show how this linked up with the general code of legislation affecting the gas industry. The other point upon which there was opposition by the Railway Companies was in respect of clause 29, which dealt with bulk supply, and was as follows:

> The Company may contract with any local authority, company, or person for the supply by the Company to them, or for the supply to the Company by them, of gas in bulk upon such terms and conditions as may be agreed upon; but nothing in this section shall authorize the Company to lay mains or interfere with any street beyond the limits of supply.

The object of this, continued Counsel, was to enable the Company to make arrangements either to supply people outside their area with gas in bulk, or, if it were to their advantage to do so, to take a supply in bulk from a neighbouring gas undertaking. The Railway Companies asked that there should be an addition to the clause to the effect that no such supply should be given by the Company beyond the Company's area of supply if, and so long as, any such supply would interfere with the supply of gas for any purpose within their limits. The effect of this would be that the Company could not give profitable bulk supplies outside their area in case these might interfere with unprofitable industrial supplies within their area upon which there was no assurance of an adequate return or any permanency in the demand. Thus clauses 21 and 29 were really connected. During recent months there had been considerable controversy with regard to this matter. The National Gas Council had also taken the matter up, and it had been arranged that one of the Orders containing this clause should be brought before the House in the form of a test case. The present Order, therefore, might be regarded as a test case, because the decision would be applicable all over the country. The Pinner undertaking was incorporated in 1897, with an area which then was purely rural. Since that time, however, there had been rapid developments. Indeed, between the years 1903 and 1923 the sale of gas had risen from 20 million c.ft. to 133 millions, and yet the area was still mainly residential, if not completely so.

Passing to a consideration of the general position, Counsel said it was regulated by the Gas-Works Clauses Acts of 1847 and 1871. Under the first Act, the undertaker was given the right to contract to give a supply of gas, but there was no obligation to give a supply. Under the Gas-Works Clauses Act of 1871, however, the obligation was placed upon a gas undertaking to supply any person requiring a supply, provided that person was within 25 yards of a main, and upon the condition that the person requiring a supply should pay the cost of the necessary mains where these exceeded 30 ft. from the premises, and also the cost of the connection to the premises, and at the same time undertake to use gas to an amount not less than 20 p.ct. per annum of the costs incurred upon mains by the company, for a period of two years. In 1871, the use of gas was mainly, if not exclusively, for lighting; but the conditions to-day were very different, because, whereas with domestic premises the demand was more or less steady, in the case of industrial uses of gas, which were now so large, the demand was very uncertain in several respects. As an example, Counsel took the case of a main supplying a street of houses, and on vacant land at the end of the street a factory was built and a supply of gas demanded. The company would be bound to give a supply under section 11 of the Gas-Works Clauses Act of 1871; but the effect would be that, whereas the main had been sufficient for the houses in the street, it would not be adequate for the houses *plus* the factory, and the pressure would fall. Consequently, the company would be put to great expense in laying a main of sufficient capacity to meet the industrial demand, and perhaps new plant at the works, without any guarantee that the industrial demand would be continued after the period of two years specified in the Act of 1871. The factory might close down, or the owners might make their own producer gas or adopt electricity. Then the company had the new plant and mains thrown upon their hands, and the inevitable effect must be an increase in the price of gas to the general body of consumers. In this way, under present conditions, gas companies were compelled to supply wholly unprofitable consumers to the detriment of the general body of users. He hoped this point would appeal to the Railway Companies generally, and especially in Pinner, because they would be affected by such circumstances, and in Pinner at present they took no supply for power or industrial purposes at all. Therefore, he submitted that the conditions of the Gas-Works Clauses Act of 1871 in regard to this matter were hopelessly out of date, and failed entirely to give any protection to the gas industry.

Though the Railway Companies were opposing the insertion of clause 21 in the Pinner Order—and, indeed, opposed it generally—there were many precedents for it, and, moreover, it appeared in the Model Bill at the present time. The clause originally was inserted in the Harrogate Act of 1909, this being the case of a Company supplying a residential district; but then the words "at a date when the supply is demanded" were omitted—he could not help thinking by an oversight. Since 1909, however, the clause had been inserted, in the very form in which it appeared in the Pinner Order, in 50 Acts of Parliament and 33 Special Orders, while in 14 Special Orders a limit of six months was inserted—a condition which the industry regarded as perfectly useless. Many of them were large industrial areas, and in all these cases he believed the clause was inserted by agreement, and not by decisions of Parliament; but, as he had already mentioned, the clause in the form in which it appeared in the Pinner Order also appeared in the Model Bills of both Houses of Parliament, and therefore was accepted by Parliament as a clause which was suitable for insertion in Acts and Orders. In 1923, the Chesterfield Corporation obtained a similar clause, with a proviso that it was not to apply where a particular main was being used for the purposes of bulk supply. In the Macclesfield Corporation Gas Act of 1923, it was stated that supply to an asylum, institution, or hospital was to be deemed to be a domestic supply; but again, this was by agreement, and not by a decision of a Committee of Parliament.

The CHAIRMAN remarked that there was one instance this year in which the clause had been struck out by consent.

Sir LYNDEN MACASSEY said that was the Marple case, to which he had already referred; the undertaking not being in a financial position to fight the Railway Companies in Parliament on the point. Referring to the Gas Regulation Act and the altered circumstances of the gas industry in consequence, Counsel drew attention to the new provisions as regards pressure in relation to calorific value, and said that the high pressures now necessary had thrown a severe burden on many gas undertakings. In the case of the Pinner Company, it had been necessary to make an application to the Board of Trade for relief from these obligations until the necessary alterations in mains, &c., could be made, in order to maintain the requisite pressure of 2 in.; and a period had been given which expired at the end of August this year. Therefore anything which tended to reduce this pressure was a serious matter, both for the Company and the consumers.

Counsel then passed to clause 29, dealing with bulk supply, and said that for many years prior to 1921 there appeared in the great majority of Gas Acts a power to the gas undertaker to supply gas outside the limits of supply, the object being to encourage sales in bulk, because obviously the more gas that could be sold the cheaper it could be made and the lower would be the price all round. There was a clause in the old Model Bill up to 1921, but since then a new Model Bill had been issued, and the clause as it appeared in the Order now appeared in the new Model Bill. The difference between the two clauses was that the old one was confined to the supply of gas by the gas authority, whereas the present Model Clause enabled the gas authority to sell or to buy in bulk. Again, the old Model Clause put a limit of seven years on such contracts, whereas now the period was unlimited. Therefore, the policy of Parliament had been to give the gas undertaking discretion as to the extent to which gas in bulk should be bought or sold. If the gas undertaking did anything to the detriment of the consumers inside the limits of supply, it was subject to penalties under the 1871 Act, and also to the stringent penalty clause in the Gas Regulation Act. In the case of electricity supply, every facility was given for supply to outside areas; and the same applied to water.

The CHAIRMAN: Your point is that the present position is unnecessary, because the Legislature provides for penalties for failure?

Sir LYNDEN MACASSEY: Absolutely.

The CHAIRMAN: How would the insertion of the proviso proposed by the Railway Companies damnify you in any way if, as you say, the existing penalties are sufficient?

Sir LYNDEN MACASSEY pointed out that the proposal of the Railway Companies was that no supply should be given outside the limits of supply so long as this might interfere with the supply inside for any purposes. In this way, they would make the gas undertaking liable to an unlimited extent for a supply for industrial purposes, whether it was profitable or not.

The CHAIRMAN: Then the real test is clause 21.

Sir LYNDEN MACASSEY said that if clause 21 were taken out of the Order, the addition proposed to clause 29, that no bulk supply shall be given outside which interferes with the supply inside, would be a serious matter for the promoters. There were forty clear precedents for clause 29 as it appeared in the Pinner Order, and there were certain cases where the proviso had been added that no supply should be given if it interfered with the supply inside the limits. There were thirteen such cases, but in ten of them the undertakings already had, in previous Acts or Special Orders, an "insufficiency of mains" clause as set out in clause 21 of the Pinner Order. The Director of Gas Administration, during the hearing of the local inquiry on the Marple Order, expressed the view that, while something on the lines of what was now the Pinner clause 21 was required, he did not think the clause was sufficiently safeguarding, and that under the clause certain consumers might be given an advantage at the expense of others. Counsel was disposed to agree with this view. The whole object of the gas industry in this matter was to prevent the general body of consumers having to subsidize industrial supplies, because if, on account of a large industrial supply coming on, the price of gas all round had to be increased in order to meet the capital expenditure involved, then it was an indirect form of subsidy; and it was not fair that the gas undertaking should take risks of this character, having regard to the want of permanency in industrial supplies in many cases.

The CHAIRMAN: Suppose you had the case of a company with a large works and small mains capacity, and a factory wanted a supply. Would the gas company then say: "We have got the gas, but the main is too small?"

Sir LYNDEN MACASSEY replied that this was the very point he wanted to meet. All he desired to do was to safeguard the gas industry from being called upon to bear an unreasonable burden. It was anxious to bear a reasonable burden in the matter of these industrial supplies.

The CHAIRMAN asked where the distinction was drawn. Would heating and cooking in a factory be domestic uses?

Sir LYNDEN MACASSEY said he was told that such cooking would be domestic use.

The CHAIRMAN: Then, as I understand it, you do not pretend that this clause is necessarily the proper means of limitation, but your clients want some form of limitation.

Sir LYNDEN MACASSEY said this was so, but his clients regarded this clause as a power to bargain. Continuing, he drew attention to the Kitson clause in Electric Power Acts, which permitted of arbitration in the event of dispute as to the terms upon which a supply of electricity might be given, and he submitted that arbitration would be a fair compromise in this case also. In order, therefore, to meet the views of the Railway Companies as far as possible, he suggested the following addition to clause 21—

> unless the person demanding or taking the supply, as the case may be, enters into a binding contract to take or continue to take and to pay for the supply of gas upon such terms as, failing agreement, shall be fixed by a single arbitrator appointed by the Board of Trade; and in fixing such terms (including the minimum annual sum to be paid to the Company) the arbitrators shall have regard to the following, among other considerations:

(1) The period for which the person to whom the supply is to be given is prepared to bind himself to take gas.
(2) The amount of gas required and the hours during which the Company can be called upon to supply such gas.
(3) The capital expenditure in connection with the supply of such gas.
(4) How far the capital expended in connection with such supply may become unproductive to the Company by the discontinuance of such supply.

Provided that any person so requiring a supply of gas shall give to the Company (if required by them to do so) security for the payment of moneys which may become due to the Company under such contract.

Provided further that the price charged under such contract shall not be taken into account in calculating the rate of dividend payable under this section of this Order of which the marginal note is "dividend dependent on price of gas."

The Chairman remarked that even this still seemed to be open to the objection that, taking the main as the unit, it might be that the main was not large enough in proportion to the capacity of the works, and that, though the Company had the gas, the main would not be large enough to supply any particular industrial user. Why should the industrial user be made to pay a part of the cost of a new main in these circumstances?

Sir Lynden Macassey said that any dispute on such a point would now be met by arbitration; and it was open to the arbitrator, under the proposed addition to the clause, to say that the Gas Company ought to lay a main of sufficient capacity, or how much or how little the industrial user should pay.

The Chairman: Supposing you had sufficient mains and not sufficient works. What would be your position under this clause then?

Sir Lynden Macassey said it would not be affected at all, because he would be subjected to penalties under the Gas-Works Clauses Act of 1871. Moreover, clause 21 did not apply to anything except mains. If the plant were not large enough to give the required supply, then the Company must put in more plant. It was only if the main was insufficient that clause 21 came into operation.

The Chairman pointed out that the Order in this case applied to the Pinner Company, which was a suburban company. It might be that general considerations would apply, but the real thing the Committee must take into account was the case of Pinner.

Sir Lynden Macassey said the arrangement in the gas industry, to which the Board of Trade were party, was that this should be regarded as a test case.

Mr. Wrottesley agreed that it was to be a test case; but his point was that the clause ought not to be in at all. He would not like to bind his clients to say that the same considerations would apply in an industrial area as in a district like Pinner.

The Chairman: We have the Pinner Order before us, and we must deal with the Pinner Order.

Sir Lynden Macassey: If that is the position, then I will proceed to call my evidence and give the Committee such assistance as I can.

Mr. *George Evetts*, Consulting Engineer to the Pinner Gas Company, said the demand in Pinner was almost entirely for domestic purposes, and, averaged over the 48 miles of mains, the total sales amounted to 2¾ million c.ft. per mile, which was a very small figure, and compared with anything from 7½ to 12 million c.ft. per mile in industrial areas. The farthest distance from the works to which the mains were now laid was 6½ miles at Harefield, while they went distances of 4½ and 4½ miles to Ruislip and Ickenham respectively. There had been trouble in maintaining the pressure at these particular points, and application had to be made to the Gas Referees for time to remove the difficulties. At the moment, 1400 yards of 6 in. main towards Hatch End were being replaced by 12-in. main, while towards Ruislip 4000 yards of new 9-in. mains were being laid. A holder was also being erected at Harefield. The total expenditure upon meeting this pressure difficulty amounted to £10,000. The Company ought to be in a position to ask for a guarantee in connection with industrial supplies, in order to justify extra capital expenditure. The only object of the Company was to get such terms from industrial users as would make it worth while to lay new mains without putting a burden on the existing consumers. From 1909 down to the present time there were 83 precedents for clause 21; and if nothing else had happened since the Act of 1871 than the enormous use of gas for industrial purposes, this alone would be justification for the change now proposed. He gave instances of the uncertainty of industrial demands, and of the manner in which gas companies might be involved in providing mains and works without any guarantee that it would be profitable. As to supply in bulk, he said the whole tendency of legislation had been to encourage this; but if the Railway Companies' proposal that no supply in bulk should be given if it were likely to interfere with the supply of gas inside the area were adopted, a prospective buyer in bulk from the Gas Company would hesitate before entering into a contract, because he on his part would have no guarantee of a continuity of supply. The Rickmansworth Council had just entered into a contract with the Watford Gas Company for a bulk supply for 21 years; but they would not have done this if there had been any possibility of interference with the supply at any time. At the same time, a gas company, in considering bulk supply, must of necessity always make the security of the supply in their own area the first consideration; and no bulk supply agreement would be entered into unless this position was assured. Having once entered into a bulk supply agreement, it was obvious that this supply could not be curtailed in any way.

The Chairman: It is not clear from your evidence whether your first duty is to your bulk customer or to the consumer in your area, if a difficulty arises.

Witness said he considered the duty would be equally to the bulk consumer and to the consumer inside. At the same time, he did not think such a position was likely to arise, because no company would enter into a bulk contract if they saw the slightest possibility of a shortage during the period of the contract.

The Chairman asked what the position would be supposing a new main was put down for a number of industrial users, who paid a proportion of the cost, and then the main was used for other people subsequently.

Witness replied that the position would probably be that a larger main than was necessary for the original consumers would be put down in the first place, but they would only be charged their proportion of the cost so far as their use was concerned.

Cross-examined by Mr. Wrottesley, witness agreed that nothing should be done which would prejudice the consumer inside a gas company's area. He also agreed that the gas industry must develop along the lines of an increasing use for industrial purposes. The last thing the gas industry wished to do was to choke off the industrial consumer.

Mr. Wrottesley put it to witness that railway companies were large users of gas for various purposes in connection with their undertakings, and that any interruption of supply would be a serious matter for the country generally, in so far as it affected the running of trains and the transport of goods. He argued that the whole principle of legislation of the country in regard to gas and kindred matters was that, in return for a monopoly in a particular area, a gas company must provide both for domestic and industrial supplies. He asked witness whether, if there were a profitable bulk supply outside an area and a doubtful industrial supply inside, he would give the preference to the bulk supply outside.

Witness replied that, broadly speaking, he would do so, because he regarded it as looking after the interests of the consumers inside, in so far as the profitable bulk supply would enable the price of gas to be reduced. But the whole position, of course, would be considered on its merits. So far as capital expenditure was concerned, there was no complaint as regards manufacturing plant; it was the expense of the mains which was the big trouble.

Mr. Wrottesley asked witness's view of the position of a company with ample manufacturing capacity at the works, but insufficient mains to supply. Would he in those circumstances refuse to supply an industrial user on the ordinary terms?

Witness said he would, if the terms were likely to be a burden to other consumers.

Mr. Wrottesley: Then you desire to be in a position where you would not supply a non-profitable consumer at all?—Yes.

You are to be the sole arbitrators as to whether a main is sufficient?—I think there should be some means of dealing with the matter of whether a main is insufficient or not.

Mr. *A. A. Johnston* (Engineer and General Manager of the Brentford Gas Company) said he had known of cases where large industrial supplies would have involved loss to the ordinary consumers by reason of the capital expenditure, if some arrangement had not been made.

Mr. Wrottesley said he did not object to the Pinner Company being protected against the cost of giving what he termed transient supplies.

Witness, in cross-examination, agreed that in Brentford the capacity of the mains was somewhat behind the capacity of the works; but he could not say whether this was symptomatic of the whole country. As an instance of a large industrial user paying a portion of the cost of the mains, he mentioned the Wembley Exhibition, in which case the Exhibition authorities had paid a fair sum. It was contingencies such as this which would be dealt with by the clause proposed. Moreover, he could not conceive anything better than a single arbitrator, appointed by the Board of Trade, to settle matters of dispute.

Sir Lynden Macassey, in closing his case, mentioned that, in an endeavour to arrive at a reasonable compromise, he had suggested the addition to clause 21, and he now wished to make a further amendment to this clause—viz., to strike out the words "in the opinion of the Company." The Company had no desire to be the judge of their own cause, and he was prepared to provide that an arbitrator should determine whether or not the main was of sufficient size.

The Chairman said it might happen that main-laying had lagged behind the requirements of the district. On the other hand, there might be a case in which the mains were ahead of the requirements; and it occurred to him that some such words as "insufficient for the requirements of the district" ought to come in. Something was required to cover the case of actually inadequate mains for the requirements of the district. He believed the Committee agreed with him that there were certain industrial demands which ought not to be subject to such an arbitration as was proposed. The clause should only be intended for large supplies.

Sir Lynden Macassey said it was very difficult to meet it in that way, because what would be a large supply in one case would be a small one in another. It would not be suggested for a moment that a clause like this should be the means of allowing a company to evade their obligations and try to make the industrial user pay for the mains.

The Chairman suggested that, in the case of a gas-engine, which would not make a very large demand on the main if it were of a reasonable size, the Company would get the cost of the main very largely out of the consumer.

Sir Lynden Macassey did not think it would work out like that, because there was not the element of permanency about industrial supplies which existed in regard to domestic requirements. The whole question was who was to pay for a new main when it was necessary to put one down to meet an industrial consumer's demand. Was it right that the cost should be imposed upon the general body of consumers in the district as a whole? He was going to suggest the addition of the following words in the first paragraph of the addition he had already proposed, after the words "appointed by the Board of Trade": "who shall determine any difference which may arise under this section between the Company and the person desiring the supply or the continuance of the supply;" the clause then continuing: "and in fixing such terms, &c.," as in the addition he had read earlier. The effect would be that the arbitrator would also have to decide whether the main was sufficient or not. He admitted that this did not meet the whole point put to him by the Chairman, but the question of principle was whether the cost of laying new mains should be borne by the industrial user or by the general body of consumers. He suggested that the latter was not a sound principle. If, however, the addition he had just suggested was made, it would be open to the arbitrator to say whether any or none of the cost of new mains for industrial

purposes should be borne by the general body of consumers. The whole scheme of the clause drew a distinct line between industrial and domestic users, and some distinction must be drawn.

The CHAIRMAN: Your argument goes so far as to say that gas companies should be relieved from all cost of mains where it is a case of industrial supply.

Sir LYNDEN MACASSEY said it was a very important question, and the point was whether big industrial users were going to be treated on the same basis as the ordinary lighting and domestic user. There were different obligations in regard to both.

The CHAIRMAN: The difficulty the Committee feel is that, as the demand in a district increases, the cost of mains will be put on some industrial user.

Sir LYNDEN MACASSEY remarked that it would be within the power of the arbitrator to say whether the industrial users should contribute towards the cost of the main.

The CHAIRMAN said there might be something to be said for the Gas Company's point of view in regard to the large users, but these cases could be differentiated from the small industrial user. He had not understood the case of the Gas Company originally to be that a hard-and-fast line should be drawn between industrial consumers and lighting and domestic consumers, and to ask that in future capital expenditure should be thrown on the industrial user.

Sir LYNDEN MACASSEY said he did not suggest that a line should be drawn between them; but some line would have to be drawn, and it was a practical difficulty where to draw it.

The CHAIRMAN suggested that it might be with regard to a demand exceeding a certain percentage of the total output for the time being.

Sir LYNDEN MACASSEY did not think he could carry the matter any further, but perhaps the Committee might be assisted if the Director of Gas Administration were to be asked to appear before them, because this was a matter of very great importance, and he would like the Committee to hear Mr. Honey's views.

Mr. WROTTESLEY asked the Committee to reject clause 21, for the reason that it did not cure the diseases that had been mentioned. He was inclined humbly to agree with the Committee that there might be hardships in particular cases. It was for the promoters to bring up a proper clause dealing with the matter. When this was done, they would not find the Railway Companies opposing. The clause as at present put forward was ill-considered, ill-adapted, and hopeless to cure the troubles that had been laid before the Committee. If it stopped there, it would be bad enough; but it did not. It purported to give the Gas Company something which was quite contrary to the practice of Parliament for the past fifty or sixty years. An endeavour was being made to repeal the Gas-Works Clauses Act of 1871, and yet put nothing in its place. If they looked carefully at the clause and the amendment, it would be seen that they started at the wrong end and proceeded on the wrong assumption. The secret of the whole thing was what Mr. Johnston had stated—that the laying of mains had lagged behind the manufacturing plant.

Sir LYNDEN MACASSEY: That was Brentford, and not Pinner.

Mr. WROTTESLEY (continuing) said the clause was one for the relief of companies who had lagged behind in the matter of laying mains, and would free them from their obligations. In the second place, the clause was one for the supply of work to arbitrators and others. The Railway Companies would not oppose a clause which would prevent hardship being placed upon the gas companies; but in the case of the small industrial user, what he got was not gas, but an arbitration. The Committee were being asked to take away the industrial user's right to gas.

The CHAIRMAN: The clause is open to objections, and the question is what is to go in its place.

Mr. WROTTESLEY suggested that a good clause might be hammered out if the Committee indicated the lines on which they thought it ought to go. Speaking on the question of bulk supply, he suggested that the argument that a profitable bulk consumer outside the area should be taken in preference to an unprofitable industrial user inside the area was contrary to the whole spirit of legislation of the country.

The CHAIRMAN intimated that Counsel need not trouble to argue his case with regard to the proposed proviso to clause 29 dealing with bulk supply.

Mr. WROTTESLEY, again dealing with clause 21, complained that it was now proposed to bring in the industrial user already taking a supply, though at first it dealt only with an industrial user asking for a new supply, and involving the laying of a new main. The whole purpose of it seemed to be to screw some more money out of industrial users, both new and old.

The CHAIRMAN: You can take it that the Committee consider it their duty to manufacture a clause without leaving any option to either side, good or bad.

Mr. WROTTESLEY, in conclusion, said the clause would enable gas undertakings to get out of difficulties which they ought never to get into. The Railway Companies were supplying a public service equally as important as, if not more so than, the supply of gas, and anything which might tend to prejudice the supply of gas for their purposes would be extremely serious for the travelling public, and for the transport of the country. Gas was used for engine turn-tables, for gas-engines, and many other purposes; and what would the position be if the gas company suddenly came down and said they could not supply gas any longer except upon new terms, and that they would have to go to an arbitrator? The clause as proposed was in a most dangerous form, inasmuch as it would give gas companies the right to refuse to supply for industrial purposes except upon arbitration terms.

Mr. H. C. HONEY (Director of Gas Administration) was then called by the Committee. He said he thought that refusal to give a supply on the part of a gas undertaking should be left to an arbitrator, and the arbitrator should be in the position to say whether the supply should be given for the purpose required, and, if so, on what terms and conditions, and for what period. The whole object was to protect the existing consumers from unnecessary expense on the undertaking, which they would have to pay if the new supply was not remunerative. He should have thought that a competent tribunal could decide in any particular case whether the demand for a supply, except by agreement, was reasonable or not.

The CHAIRMAN, after explaining the points that had been discussed during the proceedings, said the Committee felt a difficulty about the small industrial user, who they did not think should be put to the trouble of an arbitration, although arbitration should be the right course in the case of large supplies of the kind that had been mentioned. He took it that some principles would have to be laid down for such a tribunal to act upon.

Mr. HONEY said regard would have to be had to the nature of the supply demanded.

The CHAIRMAN: Would you draw a distinction between a supply for industrial uses and a supply for lighting and domestic purposes?

Mr. HONEY said it would be extremely difficult to draw a distinction between small industrial users and domestic users. He did not think that in practice any distinction would have to be drawn.

The CHAIRMAN: It seems to us that the operation of the clause as it stands may be purely arbitrary; the clause seems to penalize the company who work up to, or in advance of, their obligations.

Mr. HONEY: I think the company who take advantage of these clauses penalize themselves by refusing to accept a new customer.

The CHAIRMAN: It would enable you to pick and choose your customers.

Mr. HONEY said that clause 21, as in the Order, left the whole matter very much in the hands of the undertakers, which he did not think was desirable. The difficulty was to lay down conditions for the tribunal or arbitrator to follow.

Sir LYNDEN MACASSEY suggested that it might facilitate matters if the Order were postponed until the Autumn Session. He realized that there would not be much time to consider the position, and there was no immediate hurry on the part of the Pinner Company for the Order to go through before the adjournment of the House.

The CHAIRMAN (after consideration of the matter in private) said the Committee recognized that there was a very great difficulty to be met. They did not feel that clause 21, either in its original form or as amended, really solved the difficulty; and in these circumstances the Committee proposed to adjourn the matter over the parliamentary recess. In the meantime, it was to be hoped that the parties would endeavour to draft a clause which would meet the position as it had been left as the result of these proceedings.

Mr. WROTTESLEY said the Railway Companies would do their best to assist.

The CHAIRMAN added that, if the parties required Mr. Honey's help in any form, his services would be available.

Sir LYNDEN MACASSEY remarked that those in the gas industry knew full well the value of Mr. Honey's assistance, and would not hesitate to seek it.

MISCELLANEOUS NEWS.

PLUMBERS AND GASFITTING WORK.

Derby Men Return on Old Terms.

In the "JOURNAL" for July 23 (p. 400) an account was given of a strike at Derby which was really due to a dispute between two unions, and as a result of which certain Corporation houses could not be completed because plumbing work had not been done. The unions concerned were the Plumbers' Operatives' Union and the National Union of General Workers, who have been at variance on the question of gasfitting for a considerable time; and the strike began by a refusal of members of the Plumbers' Union to do any plumbing in Corporation houses if they could not carry out all the gas-fitting work from the outlet to the meter. Weeks ago offers of concessions by both the Corporation and the Gas Company failed to effect a settlement.

Recently a similar dispute occurred at Nottingham, where, after a strike lasting ten weeks, the Plumbers' Union gave way without having gained the point for which they left work. History has repeated itself at Derby, where, after a strike which has lasted eleven weeks, the men have returned to work under exactly the same conditions as existed before the dispute. At a meeting of the Town Council last week, Alderman Raynes, M.P. (the Chairman of the Special Works Committee), announced the terms of the settlement as follows:

> In order to assist the Corporation in the building of houses, the operative plumbers agree for a period of three months to allow their members to resume work.
>
> The Derby Corporation also agree that the representative of the Ministry of Labour be petitioned to arrange a conference of the National Federation of Building Trade Operatives and the Federation of Building Trade Employers to discuss the putting into effect of the terms of their Commission's finding of May 18, 1922.

This promise by the Corporation to endeavour to arrange a national conference to deal with the points at issue between the two contending unions could, it is pointed out, have been secured by the plumbers without a strike. As a matter of fact, the strike collapsed as soon as the Corporation intimated that, unless the plumbing work on their houses was completed without further delay, it was their intention to get the work done by authorized plumbers. For several weeks Mr. J. Ferguson Bell (the General Manager and Engineer of the Derby Gas Light and Coke Company) had been pressing for this course to be taken. In 1922 there was a similar strike in Derby, which lasted some three months; and the result was the same as on the present occasion. The strike just ended was confined to Corporation houses, no doubt in order to put pressure on the Gas Company to persuade or counsel the gasfitters to leave the National Union of General Workers and join the Plumbers' Union. The gasfitters, on the other hand, feel that they are not plumbers, and that if they left the Company's employ they could not obtain work as plumbers. Therefore they naturally declined to transfer their membership at the bidding of the Secretary of the Plumbers' Union. With this view Mr. Ferguson Bell agreed, and promised them they should remain free agents.

STOCKPORT BOROUGH GAS ACCOUNTS.

Mr. S. Meunier, the Engineer and Manager of the County Borough of Stockport Gas Department, has presented to the Gas Committee his report for the past year, during which the remainder of the debit balance has been entirely wiped out. There has been a further reduction in the price of gas, and it is hoped that the installation of new carbonizing plant will enable the Department to effect additional economies and bring charges to somewhere approaching pre-war rates within a reasonable period. Though there has been a reduction in the revenue derived from sales of gas amounting to £25,909, due to the lower price charged, there has been an increase in the quantity sold of 48,805,000 c.ft., equal to 6·18 p.ct. on the previous year's consumption. The coke market has remained good and shows an increased figure of £5201. Tar and its products have brought in only £719 more, which is accounted for by the great slump in prices of the bye-products, principally pitch, which fell from £7 10s. per ton in the early part of 1923 to about £3 in 1924. The average price of tar for the year was £5 6s. 7d. per ton, and of pitch £6 4s. 4d. per ton. Against this, however, sulphate of ammonia accounts for an additional £6729, due partly to somewhat improved prices, and partly to better working of the plant; the relative comparisons being a make of 25·5 lbs. per ton of coal carbonized in 1923, and 25·72 lbs. in 1924. The average price realized was £14 6s. 3d. per ton. There has also been a saving in gas manufacture amounting to £4053, and on maintenance of works £13,723, repairs to retorts £4435, and motor vehicles £4232. Distribution costs have also been reduced by £2581, and management by £1561; but under the heading of rent, rates, and taxes there is an increase of £5143, practically all on income-tax.

The unaccounted-for gas is the lowest in the Department's records, amounting to only 3 p.ct. of the total gas made. During the year a fresh agreement was negotiated by the National Joint Industrial Council, to hold good until April, 1925, based upon the cost of living; and under this the men have benefited to the extent of ½d. per hour and 4d. per shift, *plus* the usual 12½ p.ct. Work, such as the demolition of the 1907 carbonizing plant, extension of mains, &c., has been found for a large number of men under the Government schemes for the relief of unemployment.

In concluding his report, Mr. Meunier states that it is difficult to estimate the possibilities for the coming year, as it is certain that the market for tar products is not likely to improve materially, and it is possible that the prices for coke have about reached their maxima. However, there is a good demand for export, which is likely to continue, while the local sales have increased, so that, together with the fact that the installation of a neutralizing plant for sulphate of ammonia enables the Department to obtain materially better values than hitherto, it is possible that the higher prices asked for coal, and which many undertakings have had to pay, may to some extent be counterbalanced.

ACCRINGTON GAS RESULTS.

The sixth annual report of the General Manager of the Accrington and District Gas Board (Mr. A. J. Harrison) records a gross profit on the undertaking of £37,324, reduced, after meeting fixed charges, &c., to a net surplus of £6992. The total expenditure was £88,405, and the income £125,729. The expenditure showed a decrease of £4199 and the income a decrease of £15,111 compared with the previous year. The revenue income from gas was £91,265, against £111,666 for the previous year. Of this amount, £50,987 was collected from prepayment meters and £8709 was returned to consumers by way of rebate. The average price received for gas was 3s. 11·5d. per 1000 c.ft., against 4s. 9·9d. for the previous year. The income from residual products totalled £34,387—an increase of £5461. On the expenditure side, manufacturing costs were less by £5570, and rents and rates by £693, while the cost of distribution was higher by £2020. The gross profit is less than the previous year by £10,911, but consumers have benefited to the extent of £21,402.

The coal carbonized was 35,329 tons—an increase of 1844 tons, the average cost per ton being £1 5s. 11·3d. The quantity of gas produced was 529,954,000 c.ft., an increase of 7,841,000 c.ft. The gas accounted for totalled 465,962,000 c.ft., a decrease of 2,171,600 c.ft. The proportion of gas sold to private consumers was 95·50 p.ct., and to local authorities 4·50 p.ct. The "unaccounted-for" gas totalled 62,991,500 c.ft., equal to 11·89 p.ct. of the production—a disheartening return after five years' expensive work on mains, services, and meters. The total cost of distribution was £11,766, an increase of £2020. Mains and service repairs cost £3553, and meter repairs £5669; the whole cost being equal to 6·13d. per 1000 c.ft. of gas sold.

The appliances sold through the showroom were: Cookers, 543; wash boilers, 449; gas fires, &c., 118; grillers, 2; total, 1112. The total cash value of showroom sales was £7182. This is a record, and points to a more extended use of gas for domestic purposes.

Alderman Dewhurst (Chairman), in reviewing the report, said the most satisfactory feature was that further economies had been effected in the cost of manufacture, to the extent of £5570. The principal items were coal and wages; and if they made a comparison with 1914-15 they would find that to-day these were costing 100 p.ct. more. Yet, during the year, the cost of producing the gas was less by nearly 2d. per 1000 c.ft. than in that year. If the production of gas from coal had been at the same rate as the year 1914-15, over 15,000 tons more coal would have been required. These figures proved that the scheme of centralizing their manufacturing operations at Great Harwood had been a success. Unfortunately, distribution costs were not so good, due to changes in personnel. Rates were another grave item of expenditure. They had paid £12,751 under this head during the year, equal to about £35 for each day. Its effect on the gas undertaking was to add 3¾d. to each 1000 c.ft. of gas they sold. Their net capital indebtedness had been reduced by £15,218 during the year. On the income side, reductions to consumers amounted to £21,402, equal to 20 p.ct. of revenue, which, he thought, was a handsome gift. Allowing for this, they found the year's working showed up better than last year by about £10,500. The residual products had brought in about £5461 more than last year. Since then they had reduced the gas used for public lighting by about 50 p.ct., equal to a saving of £1000 to the constituent local authorities; the rate charged now being 15 p.ct. less than pre-war. They had also fixed a new scale of charges for gas used in industry, and this would now compare with any in the country. They were hoping this would result in a greatly extended use of gas, which would ultimately benefit all consumers. The sales of domestic gas appliances constituted a record. They might shortly ask the Board to approve further schemes to put these appliances within the reach of every householder.

GAS IN ADELAIDE.

According to the 1924 municipal year book of the City of Adelaide, Australia, the gas for power, lighting, and heating within the city is provided by the South Australian Gas Company. The Company was formed in 1861, and the following table exhibits its steady progress:

	Consumers.	Gas Sold by Meter.	Share Capital.	Loan Capital.	Book Value, Freeholds, Works, and Plant.
	C.Ft.	£	£	£	£
1870	—	17,641,000	45,000	23,350	63,528
1880	—	83,110,000	169,421	10,236	172,941
1890	—	133,255,000	222,000	—	244,047
1900	7,151	205,184,000	250,000	—	299,378
1905	10,186	213,374,000	250,000	20,000	337,729
1910	16,086	336,076,000	250,000	47,100	420,367
1915	23,273	473,617,000	399,736	80,900	717,666
1920	30,937	596,248,000	500,000	200,400	909,793
1923	40,691	837,274,000	700,000	418,100	1,219,027

Works belonging to the Company are established at Brompton, Glenelg, Port Adelaide, and Port Pirie. The method of manufacture has recently been simplified by centralizing the make of all gas for the city and suburbs at the Brompton Works. The Port Adelaide Works were in consequence closed in October, 1922, and the Glenelg Works a year later. These works are now used as holder stations for the supply of the surrounding districts, while their carbonizing plants are being maintained as a stand-by. Gas is pumped from Brompton under high pressure to the holders at Port Adelaide and Glenelg. The gas for the whole of the metropolitan area is now manufactured at Brompton, where the works cover an extent of sixteen acres, and comprise a large carbonizing and purifying plant, together with overhead telpher and mechanical equipment for handling coal and coke. These works also include machine, fitting, and repair shops, as well as shops where the Company's meters are made and repaired.

The carbonizing plant at Brompton at present consists of an installation of horizontal retorts capable of a daily output of 3 million c.ft. of gas, together with Woodall-Duckham vertical retorts (completed in 1922) with an output of one million c.ft. per day. A further vertical retort house, with a capacity of 1¼ million c.ft. per day, is now being erected, and is required to meet the anticipated demand for gas in the winter of 1925. The total length of mains is 560 miles. For the year ended June 30, 1923, approximately 1000 million c.ft. of gas, 48,000 tons of coke, and 1,130,000 gallons of tar were made; and the gross revenue amounted to £511,388.

Westminster Lighting.

The Chief Engineer of H.M. Office of Works has informed the Westminster City Council that it has been decided to adopt the Council's proposal to convert the public lamps in King Charles Street to 180 c.p. lights and to bring them within the scope of the Council's contract with the Gas Light and Coke Company for public lighting. In his letter, reported at the last meeting of the City Council, the Engineer stated that an order would be placed with the Council for the conversion of the 14 lamps in the street at an estimated cost of £10 10s., half such cost to be borne by his Department and the other half by the Council. The 14 lamps are each to be fitted with four vertical burners and converted to either 90 or 180 c.p. The present annual charge is £6 18s. 4d., whereas the annual contract rate for a 180 c.p. lamp is £6 9s. The Department also drew attention to two lamps on the refuge in Cockspur Street, near to the statue of King George III., stating that they served no very useful purpose, there being at least six public lamps in the immediate vicinity. The Department contemplated removing the two lamp standards, but the Works Committee of the City Council have informed them that, while there are other public street lamps in the immediate vicinity, those referred to served to indicate the position of the island refuge. These lamps have been in existence for a considerable period, and, if removed, difficulty might arise in the event of a collision with the refuge. The Council agreed to undertake the lighting of the two lamps in question, and to inform the Department accordingly.

Metropolitan Gas Company of Melbourne.—Messrs. John Terry & Co. (agents for the Company) have received from the Metropolitan Gas Company of Melbourne (Australia) a cabled advice informing them that their profits for the half-year to June 30 were £125,300. A dividend of 6s. 6d. per share has been declared for the half-year, a sum of £59,700 has been transferred to the reserve fund, and a balance of £72,050 carried forward. Dividends will be payable in Melbourne probably on the 1st inst., and drafts to absentee shareholders will be posted by the first mail thereafter.

GLOUCESTER GAS LIGHT COMPANY.

Special Order.

At the Board of Trade Offices, Westminster, on Friday, July 25, Mr. H. C. HONEY (Director of Gas Administration) inquired into the draft of an Order promoted by the Gloucester Gas Light Company, under section 10 of the Gas Regulation Act. The Order was printed in pamphlet form, and contained only four clauses. The first dealt with the holding of ordinary meetings of the Company, and with dividends; the second with a minimum charge for a stand-by supply; the third with supply from mains of insufficient capacity; and the fourth concerned power to create a renewal fund. As the result of the inquiry, the second clause was amended, and the third and fourth were deleted. Model clauses were added, however, dealing with the construction and placing of pipes, and the provision of a valve where high-pressure air is used.

There was opposition to the draft Order from the City Council of Gloucester and the Gloucester County Council, with regard to the stand-by and renewal fund clauses.

Mr. *J. H. Jones* (Chairman of the Company) explained the provisions of the Order. There was no opposition to the first clause, which provided that ordinary meetings of the Company should be held annually instead of half-yearly, and that it should not be obligatory upon the Company to balance their accounts or make up a balance-sheet half-yearly. There were consequential provisions enabling the Directors and Auditors who should have retired at the next half-yearly meeting, to continue in office until the next annual meeting, and giving the Directors power to declare and pay an interim half-yearly dividend without the sanction of a general meeting, such half-yearly dividend not to exceed half the authorized rates of dividend payable on the various stock. As to the stand-by clause, this provided that, notwithstanding anything contained in the Gas-Works (Clauses) Act, 1871, or any other Act, a person should not be entitled to demand or continue to receive a supply of gas from the Company for premises for which he had a supply from an installation other than that of the Company, or a supply of electricity, unless he agreed to pay such a minimum annual sum as would give a reasonable return on the capital expenditure and would cover charges incurred in order to meet the possible maximum demand for those premises. In default of agreement, the sum to be paid should be determined by arbitration. The Company, said Mr. Jones, considered they ought to get some interest on the capital involved in providing for a stand-by supply.

The third clause, relieving the Company from the obligation to give from any main a supply of gas for purposes other than lighting or domestic use where the capacity of the main was insufficient, is the one to which the railway companies have objected for some time. It was agreed to delete the clause from the present Order and to adopt the form of words decided upon by the Parliamentary Committee who were to consider the Order of the Pinner Gas Company.

The clause providing for the creation of a renewal fund limited the annual appropriation to the fund to 1 p.ct. of the paid-up capital of the Company, and the maximum amount of the fund to 5 p.ct. of the paid-up capital. In this connection, Mr. Jones pointed out that gas undertakings have to invest much more in machinery than formerly, and it would be to the advantage of the consumers that the Company should be able, by means of the renewal fund, to maintain their prices at a certain level, rather than that they should have to make a big outlay on maintenance and renewals at any one time, and so alter the price of gas spasmodically. The annual appropriation—viz., 1 p.ct., of the paid-up capital—represented £1800 per annum. In conclusion, Mr. Jones said the powers asked for in the Order were reasonable. The Company had always been on admirable terms with the City Corporation, who were friendly competitors. They wished to exercise their powers reasonably, and if they did otherwise it would certainly be to their own detriment.

Mr. *F. Beecroft* (Assistant Solicitor, Gloucester City Council) raised the general objection that the Board of Trade had no power to make the Order asked for in this case, under section 10 of the Gas Regulation Act. He gathered that the Company contended that there was authority under section 10 (2) (h), which gave the Board power to "modify or amend the provisions of any special Act or other provision relating to the undertaking affected by the Special Order as may be necessary to provide for the proper and efficient conduct of the undertaking." That section did not cover this case, because there was nothing in the Special Order proposed which would affect a special Act or other provision relating to the undertaking. The present Order did not deal with the continuation of the supply of gas, or an extension of the area of supply, or anything of that nature. Mr. Beecroft also contended that the Order could not be made under the Gas and Water Works Facilities Act of 1870, which was referred to in section 10 (1) of the Gas Regulation Act. As to the stand-by clause, Mr. Beecroft submitted a suggested revision, based on section 23 of the Electricity (Supply) Act, 1922. The City Council maintained that the minimum charge for a stand-by supply should not apply to dwelling houses or to trade premises where a supply pipe was already laid. If a customer had had a meter and pipe installed for the purpose of a stand-by supply for many years, it was unreasonable to charge him a minimum sum whether he took a supply or not. Mr. Beecroft's suggested clause limited the minimum charge to 5 p.ct. per annum on the capital expenditure and other standing charges incurred in providing and laying any mains specially required for providing such a stand-by supply. His contention was that the Company should not charge for a main already there, and which might be required for other purposes. With regard to power to create a renewal fund, the City Council considered this absolutely unnecessary, and, moreover, that it was most unusual for such a clause to be given to a gas company with a maximum dividend (such as the Gloucester Company), though it might be given to a sliding-scale company. They had already a fully accumulated reserve fund of £18,000, which was ample to cover any slight variation in the cost of repairs and maintenance. Having regard to this, and to the fact that the Company had been able to maintain a dividend at 5 p.ct. throughout the war years, and for a long period, and still maintain the plant, a renewal fund was unnecessary. It seemed that the clause would enable the Company to keep up the price of gas; while the public in Gloucester ought to have a reduction. He compared the prices in Gloucester with those in Bath; this, he said, was a fair comparison, because the quality and price in both towns before the war was the same. The price before the war was 1s. 10d. per 1000 c.ft. The present price in Bath was 5·462d. per therm, but at Gloucester it was 75 p.ct. greater than this. The pre-war price was equal to 4·074d. per therm, whereas it was now 9·032d. in Gloucester—an increase of 121·7 p.ct. The price at Gloucester should be even less than at Bath, because Gloucester was nearer the coalfield. The City Council did not wish to put the Gloucester Company to unnecessary trouble in regard to altering meters as the result of reductions in the price of gas; and he held that there was very little trouble involved by an alteration in price. Referring to the Company's accounts, he said that, for the half-year ended Dec. 31 last, they had incurred, for repairs and maintenance of works and plant, £3995, including renewals of retorts, apparatus, &c. On the distribution side they had incurred, for repairs and maintenance, a little over £8000; and at the end of the half-year they had carried forward something over £20,000.

Mr. C. B. MARSHALL (Messrs. Lewin, Gregory, and Anderson, Parliamentary Agents), for the Gloucestershire County Council, supported Mr. Beecroft's objections. The County Council were concerned in regard to nine parishes, and he was particularly anxious to reinforce Mr. Beecroft's objection to the renewal fund clause. It would be much less objectionable if it were asked for by a sliding-scale company rather than a maximum price and dividend company, because there was only one reservoir from which money could come; and if a fresh fund were created, the tendency must be to postpone a reduction in the price of gas. He had looked through a number of Orders issued by the Board of Trade, and he could not find a case where such a clause had been given to a maximum price company. As to the stand-by clause, he wanted one which was more or less in accordance with those inserted in previous Orders.

Mr. HONEY said the Board would prefer to put in a clause as nearly as possible on the lines of the electricity clause.

Mr. MARSHALL said he gathered that the Company desired to retain the provision that the sum to be charged should be such as would give a "reasonable return" on the capital expended. The addition of the words "not exceeding 5 p.ct. per annum" on the capital expenditure was reasonable, though he could not find a case in which such words had been inserted. The clause which seemed to him to meet the case best (a copy of which he submitted) was one relating only to premises used for trade or business, and not to dwelling houses, and stating definitely that the supply must be for stand-by purposes only. He would also like to see it stated in black and white that it should not apply where there were mains already laid. As to the powers of the Board of Trade to grant the present Order, he would leave that to the Board's consideration.

Mr. *Jones*, replying to Mr. Beecroft's remarks, said it was unfair and unreasonable to compare Gloucester with Bath, because the circumstances were different. The companies at Bath and Widnes differed from all others in the country, and when Gloucester was compared with all the other companies in England they came out well. The Company wished, of course, to sell gas as cheaply as possible, and to increase their power of competition with the City Council's electricity undertaking; but they did not want always to be changing the price. They had made a big reduction in March last year, and hoped to make another shortly. There were considerably over 7000 prepayment meters, and these entailed a lot of trouble. The Company would rather make an alteration once in eighteen months than at shorter intervals.

Mr. *W. S. Morland* (Engineer to the Company), dealing with the stand-by clause, said it had been suggested by the Town Clerk of Gloucester that an electricity undertaking, to meet possible contingencies, had to instal plant capable of meeting the maximum demand at any time, whereas a gas undertaking could store gas to meet unexpected demands without extending the producing plant. He pointed out, however, that a gas company had now to provide sufficient storage capacity to supply existing consumers; and if an unexpected demand arose, as the result (say) of the failure of the electricity undertaking to maintain a supply, it would be necessary to provide additional storage capacity and carbonizing plant. As to the suggestion that there should be no stand-by charge to premises where the service was already laid, he said that an existing service was depreciating whether the Company were earning revenue from it or not, and in course of time it would have to be renewed. A consumer who used electricity entirely would pay nothing towards the cost of maintaining the stand-by gas service. It would also be necessary for the meter reader to call, in order to ascertain whether or not gas had been consumed, and entries would have to be made in the Company's books. The cost of this would fall on the ordinary consumers, which would be unfair. If a person wished to have a stand-by supply, which entailed unnecessary expense, he should pay for it. Dealing with the comparison of prices in Bath and Gloucester, Mr. Morland said that conditions had altered entirely since pre-war days. At that time the Gloucester Company could buy coal, delivered to works, at 10s. per ton. At present, however, the collieries in the neighbourhood were not working, and the Company had to obtain coal from Yorkshire, and pay a heavy railway rate. The average price paid for coal during the past year was 33s. 6d. per ton, and at Bath it was 23s. 5d. At Bath there were several collieries within 7 or 8 miles of the works, so that they had no large railway rate to pay. This 10s. 1d. per ton saved at Bath represented about 1s. per 1000 c.ft. on the gas sold, which, together with an advantage of 4d. per 1000 c.ft. on their capital charge, accounted for the difference in price between the two towns. If Gloucester had the same advantages as Bath, they would be able to bring their price down to the same figure. A further advantage at Bath was that the average consumption per consumer was 50,000 c.ft., as against 38,000 c.ft. in Gloucester. It would be fairer to compare Gloucester with undertakings situated in their own neighbourhood; and Mr. Morland gave figures relating to three undertakings, all within eight miles of each other. At Cheltenham the price was 1s. per therm, or 4s. 8d. per 1000 c.ft.; at Stroud the figure was 11d., or 4s., and at Gloucester 9·032d. or 3s. 6d. Therefore, the Gloucester Company occupied a very fair position.

Asked by Mr. Honey what was the price in Bristol, Mr. Morland said he believed it was just below 8d. per therm; but he pointed out that the Bristol undertaking was close to the Somerset coalfields.

Mr. *E. Kinsey* (Gas Inspector, Gloucester City Council) pointed out that during the war, when there were complaints that the quality of the gas was poor, the Gas Company's excuse was that they had to get coal from places specified by the Coal Controller. One of those was the place from which the Bath Company were now obtaining coal, although, during the war, the coal produced there was represented by the Gloucester Company as being about as good for gas-making purposes as were clods of turf. Why, then, could not the Gloucester Company make gas from Somerset coal as well as the Bath Company, and why had not the latter Company to go to Yorkshire for their coal? He considered that Mr. Morland's argument in this regard would not hold water.

Mr. *Morland*, dealing with the renewal fund clause, said it did not refer particularly to ordinary repairs and maintenance, but to extraordinary expenditure, such as the renewal of gasholders. The Company had holders which were erected nearly fifty years ago, and renewal at present-day prices would cost nearly three times the original cost. The gas consumers of the last fifty years had had the benefit of the use of that plant, and nothing had been provided for replacing it. Thus it had been left to posterity to pay the bill when renewal was necessary.

Mr. Honey asked what the reserve fund was for.

Mr. *Morland* said it was to equalize the dividend.

Mr. Honey pointed out that it was also to meet "any extraordinary claim or demand which may at any time arise against the undertakers." Parliament had not, except occasionally, and more or less by accident, authorized a renewal fund in the case of a maximum-price undertaking.

Mr. *Morland* said that conditions now were very different from what they were 20, 30, or 40 years ago. Beyond holders and purifiers, there was not much expensive machinery used, and the consumer of that day paid for maintenance in the form of wages from week to week. At the present time, however, if they put down a vertical retort installation, which would cost (say) £50,000, from the very day they started to use it the plant was depreciating. He contended that it was not fair that the advantage obtained from this capital outlay should be given to the present-day consumer, and that the whole bill, when renewal was necessary, should be handed on to posterity. A municipal electrical undertaking, if they installed new plant, were allowed 25 or 30 years in which to pay interest and repay the capital, and they were allowed to set aside sufficient money annually. A gas undertaking should be in the same position. Even if the reserve were to be used for renewing plant, he did not think it was sufficient. He knew of one undertaking, about the same size as the Gloucester Company, which had to reorganize the works and erect vertical retorts; they had had to take £30,000 out of revenue account, with the result that there was nothing for dividends. They had had a bad time during the war, and the reserve fund was absorbed.

Mr. Honey pointed out that the Gloucester Company were in a peculiar position in regard to dividend, as compared with a sliding-scale company, in that they had power to pay arrears of dividends. If a sliding-scale company had to pay a large sum for renewals in any year, and this prevented them from paying a dividend, the shareholders lost that dividend for ever. If the Gloucester Company wanted the special purposes fund and the renewal fund which sliding-scale companies had got, their proper course was to apply for an Order to adopt a standard price and a sliding scale; but if they wished to remain a maximum dividend Company they must be content with the provisions which maximum dividend companies usually had.

Ultimately, Mr. Honey intimated his decision that the clause should be deleted.

As to the stand-by claim, Mr. Honey said that where electricity and gas were being supplied in a town, what was fair to one was fair to the other, and he saw no harm in inserting the electricity clause in this Order. When Mr. Beecroft reiterated his demand that the effect of the clause should be limited to trade premises, Mr. Honey asked if it was limited to trade premises in the case of the electricity undertaking, and was told that it was not. As a matter of fact, said Mr. Beecroft, it was never applied to dwelling houses. In the present case he wished to guard against the Gas Company's charging a minimum sum per quarter to a consumer using gas for cooking, if he had electric lighting.

Mr. Honey said he would certainly not allow a clause which would enable the Gas Company to do that, and he proposed to insert the following clause, which was inserted in the Pinner Order, 1924:

"Notwithstanding anything contained in the Gas-Works (Clauses) Act, 1871, or any other Act, a person shall not be entitled to demand or continue to receive, for the purposes of a stand-by supply only, from the Company, a supply of gas for any premises having a separate supply of gas or a supply (in use or ready for use for the purposes for which the stand-by supply of gas is required) of electricity, steam, or other form of energy, unless he has agreed with the Company to pay to them such minimum annual sum as will give them a reasonable return on the capital expenditure incurred by them in providing such stand-by supply, and will cover other standing charges incurred by them in order to meet the possible maximum demand from those premises. The sum so to be paid shall be determined, in default of agreement, by arbitration, in manner provided by the Arbitration Act, 1889."

Mr. Honey then announced that there were two other clauses which the Board considered it desirable to include in the present Order for the protection of the public, but they would not include them if there was opposition. The first was the usual provision as to construction and placing of pipes, enabling the Company to make a specification as to the minimum size and material of pipes and fittings. The second related to the provision of a valve where high-pressure air was used. There were model forms for those clauses, and they were usually inserted whether promoters asked for them or not.

There was no objection to this course, and the proceedings then closed.

TRADE NOTES.

The Underfeed Stoker Company, Ltd.

This firm have received many important orders lately; and among a large number of recent sales we notice that the Manchester Corporation Gas Department have been supplied with travelling grates, ash conveyors, and air heaters. In one case, no less than twelve underfeed stokers were supplied to a single firm.

W. C. Holmes & Co., Ltd.

This well-known Huddersfield firm have issued a booklet dealing with the production of dry neutral sulphate of ammonia. It describes the Adam process, as installed at the Beckton Works of the Gas Light and Coke Company, and the Henshaw and Stonier system which is in operation at the Talk o' th' Hill Colliery. Both these processes have been described in the "Journal."

"Through the Furnace Door."

This is the title of a new booklet recently published by Messrs. Meldrums Limited, of Timperley. It contains much valuable information and data as to the economical running of steam boilers, such as the amount of steam evaporated from coals of varying thermal values and at various boiler efficiencies; the loss of fuel heat value owing to excess of air passing through the furnaces; the loss of heat through uncovered steam piping; and various formulæ for fuel calculations. A brief description of the "Meldrum" fuel combustion apparatus which corrects such wastages is given. A useful new firebar is described and illustrated for burning difficult dust fuels, such as anthracite duff, fine coke-breeze and coke ballast, dust from pneumatic collection at collieries, sawdust, &c. This new bar has been closely investigated and found satisfactory. An oil-burner with very fine regulation is shown for use as a stand-by, for full steam-raising from oil alone, or with combined oil and solid fuel.

Chelmsford Gas Undertaking.

In his report for the year ended March 31, the Chelmsford Corporation Gas Engineer (Mr. E. W. Smith) states that the revenue account shows that, while coal has cost only £514 more than last year, there has been an increase in the sale of gas of a little over 9,000,000 c.ft. The sale of residuals shows a slightly lower income from coke, due to the reduction in the price. Tar has realized a fair return, but sulphate of ammonia has been adversely affected owing to the fall in market prices. The comparative figures for the years ended March 31, 1923 and 1924 are as follows:

—	1922-23.	1923-24.
Coal carbonized, tons . . .	8,641	9,152
Gas made, c.ft.	129,593,100	138,189,000
Water gas (included in above)	15,471,700	20,506,000
		621,850·5 therms
Gas sold, c.ft..	115,884,500	125,002,200
		562,509·9 therms

Modernization at Morecambe.

At a Council meeting held recently, the Morecambe Corporation, after inspecting the gas-works, decided to modernize the carbonizing plant. Mr. J. C. Wilson (Chairman of the Gas Committee), in submitting the proposals, informed the Council that vertical and other carbonizing systems had been carefully considered by the Committee, but they had finally decided to recommend the adoption of Drakes machine-charged horizontal settings. The existing retort bench is 27 years old and would require considerable expenditure to bring it up to date; and the Committee were not prepared to recommend this plan. The new scheme provides for a million c.ft. per day horizontal carbonizing plant complete with mechanical coal wagon tipper, 48-hour coal storage bunkers, and mechanical coke-handling plant. Adjoining land on which part of the new plant will be erected, and which will provide for the erection of a new gasholder at some future date, is to be purchased. The proposals are part of a progressive reconstruction scheme adopted by the Gas Committee 18 months ago, and prepared by the Borough Engineer, Mr. T. W. Barratt, M.C., Assoc. M. Inst.C.E. A million c.ft. per day Livesey washer and a rotary one of the same capacity have recently been installed; also a Humphreys and Glasgow carburetted water-gas plant. A new boiler-house with Lancashire boilers and self supporting steel chimney will shortly be completed. The Council approved of the proposals submitted; and application for the necessary powers is to be made to the Government Departments concerned.

Therm System at Manchester.—The Manchester Gas Department have issued a notice to consumers, to the effect that from Aug. 1 last all accounts will be charged on the basis of the therm. A table given of the scale of prices shows that the present rate of 3s. 2d. per 1000 c.ft. for consumers of under 20,000 c.ft. per quarter within the city will be replaced by 8·44d. per therm, subject to a discount of ½d. per therm (equivalent to 2½d. per 1000 c.ft.) for payment within 28 days from the delivery of the account.

Abercarn Gas Results.—In his annual report to the Abercarn Urban District Council, Mr. T. Wilkinson (the Engineer and Manager) states that the gross profit on the year's working is £5164, as against £4362—an increase of £802. After providing for interest and instalment of loans, income-tax, &c., there remains a net profit of £838. The gas sold during the year amounted to 38,915,200 c.ft., compared with 40,072,500 c.ft last year. The price of gas has been reduced by 6d. per 1000 c.ft. to ordinary consumers and by 1s. 2d. to prepayment consumers.

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

This year's August Bank Holiday will come as a relief to coal producers, in that it will mean at any rate one day's less coal to dispose of—such is the unfortunate state of the market at the present time. The Durham wages ascertainment shows a slight reduction, which should amount to a few pence per ton on the output. At the new figure, on the terms of the recently concluded agreement, this is within a few points of the minimum, so that much further relief in this, the main item of cost, cannot be looked for. The outlook for every one concerned is very serious, and old hands on the market are agreed that the trade is experiencing one of the worst times ever known.

Northumberland best steams and good Durham gas coals are the only sections to show any steadiness, but demand even for best gas makes is very slack for early delivery. Wear Specials quote about 23s., and best qualities 21s. 6d. to 22s. 6d. f.o.b. Actual prices at which spot cargoes can be arranged depend upon individual colliery positions, but sellers are still holding fairly firm for forward contracts. Seconds are obtainable at 18s. 6d. to 20s.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

There has been practically no change in the Yorkshire and Lancashire markets since last week. So far as prices are concerned business has probably steadied up somewhat. There has been very little increase in the demand for any description of coal. In regard to coal for domestic purposes, the public have not taken heed of the recommendation of the trade to store up coal in readiness for the winter months, and they will, therefore, have to take the inevitable consequences. Coal is undoubtedly several shillings a ton cheaper to-day than it will be when the first touch of winter makes itself felt. There seems to be no improvement so far as the demand for coal for industrial purposes is concerned, and it is believed that the only thing which will bring about an increased demand will be a satisfactory conclusion of the conference now sitting in London. This would create confidence in the industrial world, and the effect would be reflected in the coal trade. The market for export trade is absolutely at the lowest ebb, there being no demand from any country. Inquiries from Belgium are *nil*. A communication has been received by a Leeds firm of coal merchants from Belgium deploring the condition of the coal trade there. The report states that colliery owners in Belgium have approached the Government in regard to the amount of German Reparation coal which is coming into that country. The importation of British coal is practically at a standstill, and German competition has dealt a severe blow at British trade.

Prices at Hull at the week-end were: Bunkers: Yorks, Derby, and Notts large screened steam, f.o.b. Humber ports, 20s. to 20s. 6d. Cargo for export, f.o.b. usual shipping ports: Best Yorks hards, association, 23s.; Derby best hards, 22s. 9d. to 24s. 6d.; best Yorks Hartleys, 20s. to 22s.; South Yorks washed doubles, 19s. 6d.; South Yorks washed singles, 19s. 6d.; dry doubles, 16s. to 16s. 6d.; South Yorks washed smalls, 16s.; Derby slack, 1 in., 13s. 6d.; South Yorks rough slack, 14s. 6d.; gas coke, 34s. to 37s.; foundry furnace coke, 20s. 3d. to 20s. 6d.; washed smithy peas, 22s. to 26s. 6d.; washed steam thirds, 19s. 6d.; South Yorks washed trebles, 20s. 6d. per ton.

Lancashire collieries still quote 34s. to 35s. at the pit, but there is no buying yet of any quantity, and merchants anticipate easier prices later on. Industrial coal is quiet. Slacks are quiet from about 13s. to 17s. at the pits. Furnace coke is also rather depressed.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The Staffordshire and Warwickshire coalfields will be idle until Thursday, and judged by past experience of holiday times not much coal will be raised this week. Nor will much be wanted, for all the industrial establishments are closed for the week, and have some stocks on which to restart. Up till now the pits have been kept going wonderfully well. Some have been working full time; others four days a week or so. Householders with accommodation have been laying-in stocks, profiting by the experience of last winter; and so well booked are the collieries and merchants that special concessions are already being withdrawn. Slacks are easy, and D. S. nuts and hard coal for furnaces plentiful, the chief run being on coal suitable for storing.

Croydon Gas Company's Dividend.—Dividends have been declared by the Directors of the Croydon Gas Company, payable on Sept. 1, for the half-year ended June 30, at the following rates per annum: Redeemable preference stock, 7½ p.ct.; maximum dividend stock, 5 p.ct.; sliding-scale stock, 6½ p.ct. These are at the same rates as for the corresponding period of 1923.

Results at West Bromwich.—The annual report of the gas undertaking was presented to a meeting of the Town Council last week by the Chairman (Alderman Cox). He pointed out that the income for the year was £110,224—a decrease of £7135, which, he said, was accounted for by a reduction of 9d. in the price of gas during the year. The gross profit was £14,499, and the net profit £5382. The amount of gas made in 1924 was 433,494,115 c.ft., and the amount of coal used for making this was 27,494 tons. In 1923 the gas made was 383,449,612 c.ft., and the coal used 29,319 tons. This was an increase of 50 million c.ft. of gas made, while the coal used was 1825 tons less. With regard to coke and ammoniacal liquor, the year had been favourable.

GAS REGULATION ACT, 1920.

BOYS' CALORIMETER

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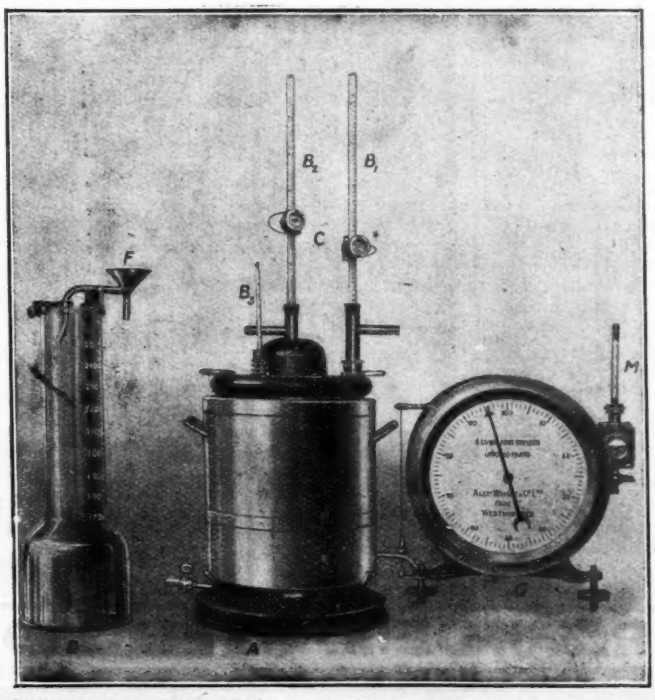


CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Aug. 5.*

There is very little movement in the London tar products market, and prices generally remain unchanged. Pitch is in the neighbourhood of 60s. per ton, and creosote about 6¾d. per gallon. Other products are without change.

Tar Products in the Provinces.

Aug. 5.

The average values for gas-works products during last week were: Gas-works coal tar, 42s. to 47s. Pitch, East Coast, 55s. to 57s. 6d. f.o.b. West Coast—Manchester, 50s. to 52s. 6d.; Liverpool, 51s. to 52s. 6d.; Clyde, 52s. to 55s. Benzole 90 p.ct., North, 1s. 5d. to 1s. 6d.; crude 65 p.ct. at 120° C., 1s. to 1s. 1d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 10d. Toluole, naked, North, 1s. 5d. to 1s. 6d., nominal. Coal tar crude naphtha in bulk, North, 7¾d. to 8d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 5d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, liquid, 6d. to 6¼d.; Scotland, 5¼d. to 5½d. Heavy oils, in bulk, North, 9d. to 9¼d. Carbolic acid, 60 p.ct., 1s. 10d. to 1s. 11d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

South Suburban Gas Company's Dividend.—The Directors of the South Suburban Gas Company have declared a dividend for the half-year ended June 30 at the rate of 6½ p.ct. per annum on the 5 p.ct. ordinary stock.

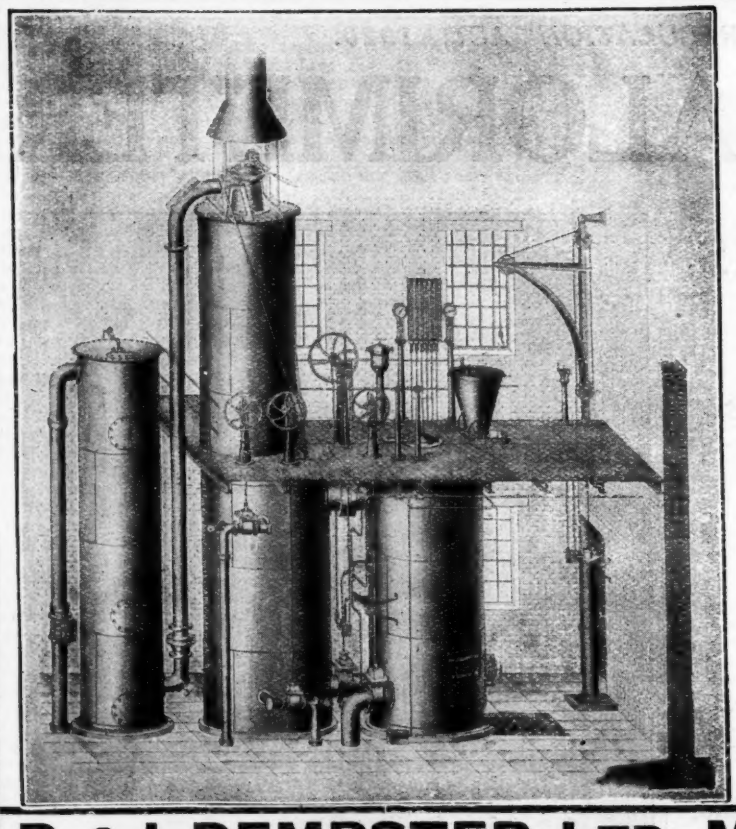
Reducing Carbon-Monoxide Risks.—With regard to the measures for reducing the risk of poisoning by carbon monoxide in public gas supplies, suggested in the Report submitted to the Board of Trade by Mr. W. J. A. Butterfield, one of the Gas Referees, it is officially pointed out by the Birmingham Gas Department that the proposals have to a large extent been carried out by them. For years past, gas fittings manufactured from solid-drawn tube have been offered for sale at the various showrooms of the Department, to the exclusion of the brazed tube. The Department periodically examine and maintain in good condition the gas fittings for which they are responsible in the houses of prepayment consumers. When it is necessary to change them, the solid-drawn tube is fitted in place of the brazed tube. The supply pipes in the houses are the property of the landlord, but the Department insist on a proper size and quality of tube being used. The Department are not responsible for the fittings purchased and fixed by ordinary consumers. They have, however, long advocated the use of good-quality fittings, though they possess no powers to prevent the use of cheap and inefficient appliances.

Satisfactory Results at Coventry.

The Coventry City Council had before them at their meeting last week the annual statement and the accounts of the gas undertaking. Mr. Cleverley, the Chairman of the Gas Committee, said that the outstanding features were the large increase in the volume of gas sold, and the substantial reduction in price, made on two occasions during the year. The amount received for gas showed a decrease of 9·34d. per 1000 c.ft. as compared with the previous year, representing a saving of £70,082 to consumers. In spite of these reductions, the revenue from the sale of gas was only £31,311 less than last year, due to the increased quantities sold; the total being 1935 million c.ft.—an increase of 224 million, or 14·1 p.ct., on last year. There was an increase of 42 p.ct. in gas used for industrial purposes, and 12 p.ct. and 7 p.ct. respectively through ordinary and prepayment meters for domestic purposes. The number of consumers had increased by 559, making the total number 35,793, of which 25,379 were prepayment consumers. A total of 30,680 cookers had been fixed, and 183½ miles of mains were now laid. Receipts from residuals showed an increase of £28,435; 69·06 p.ct. of the cost of coal and oil being recovered by the sale of residuals. The gross profit for the year amounted to £102,611; being a decrease of £37,381. After deducting capital charges, income-tax, expenses of new meters, stoves, mains, &c., the net surplus on the year amounted to £3290. To this there was added £48,020 brought forward from last year, making a total of £51,310 for disposal. Of this it was recommended that £10,000 be allocated as a contribution to the rates for 1924-25, and £5000 for 1925-26; to transfer to special renewals account £26,000, to working capital £10,000, and to carry forward £310.

Gas Standards Sixty Years in Use.—On the introduction of electric lighting in Nenagh (co. Tipperary), the local Gas Company are removing the gas standards, which have been in use since the inauguration of the gas service sixty years ago.

Purchase of Newark Gas-Works.—Mr. O. Quibell (the Chairman) presided at an extraordinary meeting of the Newark Gas Company on Friday, and proposed that the agreement between the Company and the Newark Corporation for the sale of the undertaking, at the price mentioned in the agreement, be approved. He explained that the agreement provided that shareholders would receive for each "A" £10 share and "B" £10 share the sum of £20, and for each new ordinary £10 share £14. Payment would be made at the option of the shareholders by cash or by mortgage with the Newark Corporation, bearing interest at the rate of 5 p.ct. per annum for a period of not less than five years. The preference shares would be taken over by the Corporation, and would bear the existing rate of interest of 7 p.ct. per annum, and would be redeemable in accordance with the original terms of issue. The Directors' compensation would be for a period of five years, and the reserve fund of £2500 would be held for expenses. The resolution was carried.



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STOCK MARKET REPORT.

WITH the holiday season in full swing business on the Stock Exchange, as might have been expected, was inactive and dull, but there were encouraging features in some markets. The defeat of the rebels at San Paulo brought about a recovery in Brazilian securities, and dividend rumours and announcements improved prices in the Miscellaneous and Commercial markets. Tobaccos were most prominent. The Conference of the Allies continues to make progress, but opinion is still divided on the question of international guarantees, and there is little hope of the Loan to Germany maturing unless the American Government agree to participate in the guarantee. Anxiety with regard thereto is overshadowed by the serious position created in Ireland over the boundary question.

British Funds were firm, the 3½ p.ct. Conversion Loan rising ⅜ on the week. Home Rails remained dull. The "big four" interim dividend announcements are at the same rate as last year, and in spite of pessimistic rumours some of the preference and ordinary shares would appear to be good investments—yielding on present quotations from 6 p.ct. to 9½ p.ct.

Business in the Gas Market was normal for the time of the year. It will be noticed that the fluctuations in the quotations were with one exception in an upward direction. All were due to the proximity of dividend distributions, the exception being Bristol 5 p.ct. max., which dropped a point *ex* div. The last of the Metropolitan Companies' dividends was announced on Saturday, the South Metropolitan Company declaring 5 p.ct. interim dividend for the past half-year, being at the same rate as last year. The rate is no indication of what the final distribution will be. The authorized rate, which is, on the unique method of calculation peculiar to the South Metropolitan Company, not possible to ascertain until the end of the year, will probably be over 7 p.ct.

The following transactions were recorded during the week:

On Monday, Bournemouth "B" 12 11/16, Brighton and Hove "A" 127, Croydon maximum 87, Gas Light and Coke 92½, 92⅝, 92¾, 93½, 93¾, 3½ p.ct. maximum 64, 4 p.ct. preference 80¼, 81, 3 p.ct. debenture 61½, 62½, Imperial Continental 166, 167, Primitiva 6s. 4½d., 6s. 6d., South Metropolitan 99½, 99⅝, 100, Wandsworth "A" 135, "B" 115. Supplementary prices, Brighton and Hove 6 p.ct. "B", preference 107, 7 p.ct. new debenture 104⅝, 105¼, Malta and Mediterranean 1st (7 p.ct. preference) 95s., 96s. 3d., Pinner 6 p.ct. preference 5⅜.

On Tuesday, Aldershot "C" 82⅜, 83, Bournemouth "B" 12 11/16, Brentford "B" 103½, 104½, Brighton and Hove 172½, "A" 127, 127⅛, British 117½, Commercial 4 p.ct. 89¼ *ex* div., European 7⅜, 7⅝ *ex* div., Gas Light and Coke 92¼, 92½, 92⅝, 93, 93½, 93¾, 3½ p.ct. maximum 64, 4 p.ct. preference 80⅜, 81, 3 p.ct. debenture 61½, Imperial Continental 165⅝, 166⅜, Newcastle 82⅞ *ex* div., Primitiva 6s. 4½d., South Metropolitan 3 p.ct. debenture 60½, South Suburban 5 p.ct. 104½, Southampton 4 p.ct. debenture 76⅜, Swansea 6½ p.ct. debenture 103½, Wandsworth (Wimbledon) 112. Supplementary prices, Aldershot "C" 83, Hornsey "A" 192.

On Wednesday, Alliance and Dublin 64⅝, 65¼, Brentford "A" 103½, 104, 104½, 105, "B" 104, 104½, 105, 6 p.ct. Richmond debenture 102, Brighton and Hove "A" 127½, Cape Town 4½ p.ct. debenture 74, Gas Light and Coke, 92⅜, 93¼, 93⅜, Imperial Continental 165, Newcastle 83 *ex* div., South Metropolitan, 99½, 99⅝, 100, 100½, Swansea 6½ p.ct. debenture 103. Supplementary prices, Brighton and Hove 6 p.ct. "B" preference 107⅜.

On Thursday, Brentford 4 p.ct. debenture 78, 78½, 6 p.ct. Richmond debenture 103, British 117, European 7⅜ *ex* div., Gas Light and Coke, 92⅜, 92⅝, 93, 93¼, 93⅜, 93½, 3½ p.ct. maximum 64⅜, 4 p.ct. preference 80¼, 3 p.ct. debenture 62¼, Imperial Continental 165⅝, 166, 167, Montevideo 55½, Newcastle 82½ *ex* div., South Metropolitan 99½, 100, 100¼.

On Friday, Alliance and Dublin 65, 65¼, 65½, Bombay 5½, Bournemouth "B" 12⅝, European 7⅝, 7¾ *ex* div., Gas Light and Coke 92⅜, 93, 93¼, 93½, 3½ p.ct. maximum 63½, 64⅜, 3 p.ct. debenture 62½, Imperial Continental 165, Montevideo 55⅛, 56½, Primitiva 6s. 3d., 6s. 7½d., 4 p.ct. (River Plate) debenture 57, South Metropolitan 99½, 100¼, 3 p.ct. debenture 60. Supplementary prices, Aldershot "C" 82⅜, 83½.

Stringent conditions prevailed in the Money Market at the beginning of the week, but supplies were fairly plentiful at the close, possibly assisted by the distribution of seven millions Government dividends. The Treasury Bills average rate was, at £3 13s. 5·41d., higher than expected.

The Foreign Exchange Market was more active at the end of the week, due doubtless to the brighter Conference outlook. There was a sharp recovery in French francs, which closed at 85.90. Other "reparation" currencies displayed a better tendency.

The Bank rate is 4 p.ct., to which it was raised from 3 p.ct. on July 5, 1923. Bankers' deposit rates are 2 p.ct.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Aug 1.	Rise + or Fall − on Week.	Transaction Lowest and Highest Prices.
£			% p.a.	% p.a.				
131,978	Stk.	Feb. 7	5	5	Aldershot 5 p.c. max. C.	81—84	..	82½—83
235,492	,,	,,	4	4	Do. 4 p.c. Pref.	70—73	..	..
1,551,868	,,	Apr. 3	5½	6	Alliance & Dublin Con.	63—68	..	64⅛—5
374,000	,,	July 10	4	4	Do. 4 p.c. Deb.	60—65	..	..
280,000	5	May 22	8	8	Bombay, Ltd.	5—5½	..	5⅛
100,000	10	Mar. 6	8½	8½	Bournemouth 5 p.c.	12¼—13¼	..	..
383,110	10	,,	7	7	Do. B 7 p.c.	12—13	..	12⅛—12 11/16
150,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	..
50,000	Stk.	June 26	3	3	Do. 3 p.c. Deb.	54—59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	74—79	..	..
992,045	,,	July 10	6 1/16	6 1/16	Brentford A Con.	103—106	+2	103½—105
990,500	,,	,,	6⅛	6⅛	Do. B New	103—106	+2	103½—105
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	87—92	..	..
306,690	,,	June 12	4	4	Do. 4 p.c. Deb.	75—80	..	78—78½
181,337	,,	,,	—	6	Do. 6 p.c. Rich. Red. Deb.	100—105	..	102—103
214,740	,,	Mar. 6	11½	11½	Brighton & Hove Orig.	171—176	+1	172½
244,200	,,	,,	8	8½	Do. A Ord.	126—129	+1	127—127½
1,287,500	,,	July 24	5	5	Bristol 5 p.c. max.	91—92*a*	−1	..
455,000	,,	Mar. 20	—	7	British Ord.	117—122	..	117—117½
100,000	,,	June 26	7	7	Do. 7 p.c. Pref.	118—123	..	..
130,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72—77	..	..
100,000	10	May 22	6	8	Cape Town, Ltd.	6½—7½	..	..
100,000	10	Apr. 24	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
150,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb.	7—76	..	74
626,860	,,	July 24	6	6	Cardiff Con. Ord.	97—100*	..	..
237,860	,,	June 26	7½	7½	Do. 7½ p.c. Red. Deb.	103—106	..	..
157,150	,,	Mar. 6	5	6½	Chester 5 p.c. Ord.	88—93*b*	..	..
1,513,280	,,	July 24	6	6	Commercial 4 p.c. Cap.	88—93*	..	89½
360,000	,,	,,	6	6	Do. 3½ p.c. Cap.	88—93*	..	..
475,000	,,	June 12	3	3	Do. 3 p.c. Deb.	56—59	..	..
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd.	27—32	..	..
200,000	,,	June 12	7	7	Do. 7 p.c. Pref.	77—82	..	..
660,000	,,	Mar. 6	6½	6½	Croydon sliding scale	101—104	..	..
284,975	,,	,,	5	5	Do. max. div.	85—89	+1½	87
492,270	,,	Feb. 21	3	4½	Derby Con.	108—110*c*	..	..
55,000	,,	July 10	4	4	Do. Deb.	74—76*c*	..	..
209,000	,,	Apr. 3	5	5	East Hull 5 p.c. max.	..	..	..
1,002,180	10	July 24	2	6	European, Ltd.	7½—8¼*	..	7⅜—7½
16,503,045	Stk.	Feb. 7	5½	5½	Gas Light & Coke 4 p.c. Ord.	92—94	..	92½—93½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	62—65	..	63½—64½
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	80—83	..	80½—81
4,761,930	,,	June 12	3	3	Do. 3 p.c. Con. Deb.	61—64	..	61½—62½
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 20	6½	6½	Hastings & St. L. 5 p.c. Conv.	91—96	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	76—81	..	..
70,000	10	May 8	10	10	Hongkong & China, Ltd.	16—17	..	..
86,600	Stk.	Mar. 6	9½	10	Hornsey 7 p.c.	143—148	..	..
1,976,000	,,	May 22	10	30	Imperial Continental Cap.	165—170	..	165—167
263,950	,,	Feb. 7	3½	3½	Do. 3½ p.c. Red. Deb.	69—72	..	..
235,242	,,	Mar. 6	6½	6½	Lea Bridge 5 p.c. Ord.	9—10	..	..
2,127,340	,,	Feb. 21	5½	5½	Liverpool 5 p.c. Ord.	90½—91½*b*	..	..
600,000	,,	Mar. 20	7	7	Do. 7 p.c. Red. Pref.	103—106*b*	..	..
165,736	,,	Feb. 21	9	8	Maidstone 5 p.c. Cap.	124—129	..	..
63,480	,,	June 26	3	3	Do. 3 p.c. Deb.	53—58	..	..
75,000	5	,,	5	7	Malta & Mediterranean	3½—3¾	..	..
541,920	Stk.	June 12	4	4	Montevideo, Ltd.	54—59	..	55½—56½
1,875,892	,,	July 24	5½	5	Newcastle & Gateshead Con.	83—84*d*	..	82½—83
250,166	,,	,,	4	4	Do. 4 p.c. Pref.	74—75*d*	..	..
529,705	,,	June 26	3½	3½	Do. 3½ p.c. Deb.	70—70½*d*	..	..
15,000	10	Mar. 6	11	11	North Middlesex 10 p.c.	16—17	..	..
75,940	10	,,	7 7/16	7 7/16	Do. 7 p.c.	11½—12	..	..
300,000	Stk.	May 8	9	7	Oriental, Ltd.	98—101	..	..
138,120	,,	June 26	7⅞	7⅞	Plym'th & Ston'house 5 p.c.	112—117	..	..
60,000	50	Mar. 6	13	13	Portsea Island B	102—105	..	..
100,000	50	,,	12	12	Do. C	98—103	..	..
2,289,909	1	—	—	—	Primitiva Ord.	⅛—¼	..	6/3—6/7½
341,400	100	June 2	4	4	Do. 4 p.c. Red. Deb.	74—77	+2	..
600,000	Stk.	July 24	4	4	Do. 4 p.c. Red. Deb. 1911	53—55*	..	..
220,335	,,	June 26	4	4	Do. B. Aires 4 p.c. Rd. Db.	54—57	..	..
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	54—57	..	57
150,000	10	Mar. 20	6	6	San Paulo 6 p.c. Pref.	7—7½	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	41—43	..	..
270,000	Stk.	Mar. 20	5	5/8/4	Sheffield A	99—101*e*	..	..
419,968	,,	,,	5	5/8/4	Do. B	99—101*e*	..	..
1,047,000	,,	,,	5	5/8/4	Do. C	99—101*e*	..	..
90,000	10	June 12	6	8	South African	7—9	..	..
6,609,895	Stk.	Feb 21	5	6½	South Met. Ord.	99—101	+½	99½—100½
102,580	,,	July 10	5	5	Do. Red Pref.	96—98	..	60 60½
1,895,445	,,	,,	3	3	Do. 3 p.c. Deb.	58—61	..	..
734,000	,,	Mar. 6	6½	6½	Do. 6½ p.c. Red. Deb.	103—105	..	..
91,500	,,	,,	8½	8½	South Shields Con.	136—138*d*	..	..
1,087,795	,,	Feb. 21	6	6½	South Suburban Ord. 5 p.c.	103—108	+2	104½
368,837	,,	June 26	5	5	Do. 5 p.c. Deb.	93—98	..	..
647,749	,,	May 8	6	5	South'mpt'n Ord. 5 p.c. max.	85—88	..	..
121,275	,,	June 26	4	4	Do. 4 p.c. Deb.	73—78	..	76½
250,000	,,	Mar. 6	7	7	Swansea 7 p.c. Red. Pref.	104—106	..	..
200,000	,,	June 26	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	..	103—103½
120,000	,,	July 24	8	8	Tottenham District A 5 p.c.	116—119*	..	..
382,275	,,	,,	6½	6½	Do. B 3½ p.c.	99—102*	..	..
181,255	,,	June 12	4	4	Do. 4 p.c. Deb.	76—80	..	..
258,251	,,	Mar. 20	5	7/14/4	Tynemouth Con. and New Wandsworth, Wimbledon, and Epsom—	87—89*d*	..	..
30,000	,,	July 10	9½	9½	Wandsworth A 5 p.c.	132—137	..	135
255,636	,,	,,	7½	7½	Do. B 3½ p.c.	110—115	..	115
108,075	,,	,,	6/7/9	6/9/6	Do. C	96—101	..	..
240,865	,,	,,	6/7/9	6/9/6	New Ordinary	..	..	..
352,000	,,	,,	7½	7½	Wimbledon 5 p.c.	110—115	..	112
98,000	,,	,,	7½	7½	Epsom 5 p.c.	115—120	..	..
88,416	,,	June 26	3	3	3 p.c. Deb.	55—60	..	..

Quotations at:—*a*.—Bristol, *b*.—Liverpool, *c*.—Nottingham, *d*.—Newcastle, *e*.—Sheffield. * Ex. div.

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Public Lighting Contract at Haywards Heath.—In competition with the Electricity Company, the Haywards Heath District Gas Company have obtained the contract for street lighting in Haywards Heath for three years. Previously the contract was made for a period of only one year.

The British Bergius Syndicate, Ltd., has been registered as a private company to manufacture, deal with, and render saleable oils and other products obtainable from mineral oils, coal, and other bituminous materials. The capital is £25,000, and the address is Wellington House, Buckingham Gate, S.W.

Chesterfield Gas Plant.—At a meeting of the Chesterfield Town Council on Friday, the Chairman of the Gas Committee (Alderman G. Clark) referred to a recommendation to instal new plant at the Central Gas-Works, including exhausters, condensers, washers, and scrubbers, at a total cost of £4500. The Council approved of the scheme.

Sunderland Gas Increase.—The Sunderland Gas Company have raised the price of gas by 3d. per 1000 c.ft. as from the quarterly meter readings in August and September. The new price will be 2s. 6d. per 1000 c ft., less discounts of 1d. to 6d., according to consumption, which charge is still one of the lowest in the country. The increase is due to the fall in the price of residuals, particularly tar.

Hebden Bridge Gas Board.—The annual report issued by the Hebden Bridge and Mytholmroyd Gas Board shows the gross profit for the past year to be £9609, and the net profit £1309, compared with £3224 last year. The quantity of gas manufactured was 114,571,000 c ft., being an increase of 9,586,000 c.ft. over the previous year. After considering the report, the Board decided to reduce the price of gas by 4½d. per 1000 c.ft.

Brechin Gas Company.—The annual report of the Company for the year ended June 30 shows the balance at credit of profit and loss account, after meeting interest on debentures, dividends on preference shares, and providing for redemption of debentures and depreciation, to be £1716, out of which the Directors recommend the payment of a dividend on the ordinary shares at the rate of 8 p.ct., free of income-tax. This will absorb £1440, and leave a balance of £276 to be carried forward.

Drogheda Gas Strike.—As a result of a six weeks' strike of Drogheda municipal gas-workers on a question of wages cut, very grave inconvenience was caused to the public. On a settlement being announced, arrangements were made to resume the supply, but this could not be done for several days. The loss to the Corporation is, of course, substantial; but the experience has induced citizens to have an enhanced appreciation of the value of gas. Mr. P. Carroll, presiding at a meeting of the Corporation Law and Finance Committee, expressed a hope that in future disputes arbitration would be resorted to, and that the strike method, ruinous in every way, would be abandoned.

Wandsworth Gas Company's Standard Price.—The recommendation of the Public Control Committee that application be made to the Board of Trade for an Order reducing the standard price applicable to the Wandsworth, Wimbledon, and Epsom District Gas Company was adopted without discussion by the London County Council at their meeting on Tuesday of last week.

Barnstaple Coal Conveying Plant.—The Barnstaple Lighting Committee have received a letter from the Unemployed Grants Committee stating that they are prepared to make a grant of 50 p.ct. of the interest on the loan raised in connection with the installation of coal conveying and storage plant up to an expenditure not exceeding £2400; the grant to be operative for fifteen years, or the authorized term of the loan, whichever was the less.

Dublin Gas Supply.—The Alliance and Dublin Consumers' Gas Company's supply has proved more than ordinarily useful to the citizens and those of the adjacent townships during recent weeks, owing to a strike, over a wages cut intimation, of municipal workers, involving the suspension—partial at first, and complete in the long run, except as to hospitals and bakeries—of the electric lighting and power services. The demand for gas was very extensive. Much satisfaction was expressed by the citizens at the efficient maintenance of the gas service. Public lighting arrangements were affected to a considerable degree; these being largely under municipal supervision.

Teignmouth Gas Affairs.—At a meeting of the Teignmouth Urban District Council last week a letter was read from the Ministry of Health stating that, after considering the report of the inspector, Mr. R. C. Cox, who recently held an inquiry into the Council's application to borrow £6874 for the purpose of the gas undertaking, said the Department had decided to give approval for the borrowing of £2146 for the provision of a carburetted water gas plant, but as regards the loan for the retaining wall surrounding part of the site proposed to be acquired on the foreshore for the extension of the gas-works, sanction would be deferred until the Council had obtained a Special Order authorizing them to manufacture gas on that site. The Ministry advised the Council to reconsider the question of constructing this wall in mass concrete, having regard to its situation and the action of sea water, and said the design and calculations for the structure should be submitted to an independent engineer with experience in reinforced concrete work. The Department further stated that they were prepared to approve the proposal to supply gas to Shaldon, but suggested the substitution of cast iron for the steel main across the river, and the laying of the main at a greater depth, and advised that the Council should consult an engineer of experience in this class of work. The Department said they did not understand how it was proposed to clean out the main when blocked by condensation or deposits of naphthalene. The Council deferred further consideration of the matter until a reply had been received to a letter which the Clerk had written to the Ministry of Health.

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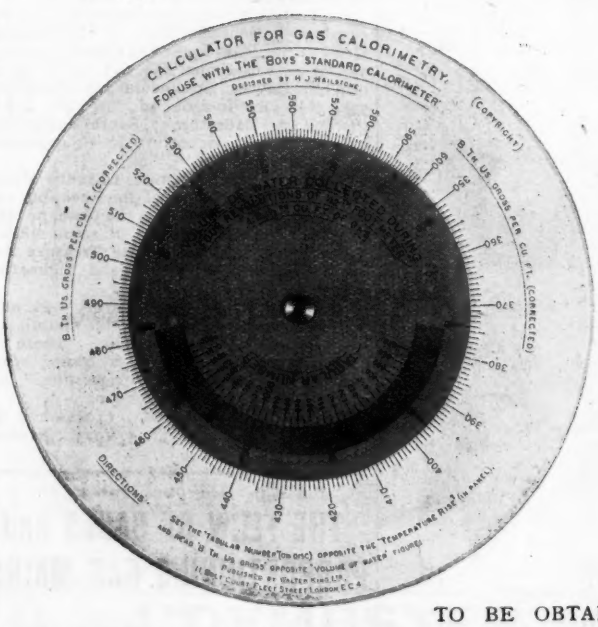

Designed by Mr. H. J. HAILSTONE, of the Rochdale Corporation Gas Department.

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(See Article in "JOURNAL," May 21, p. 523.)

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